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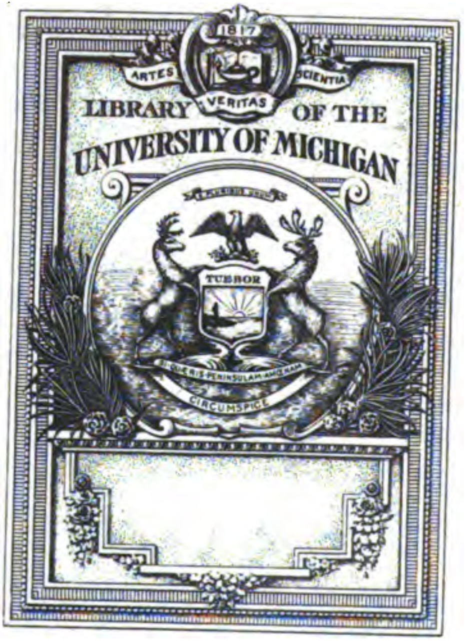

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STATE OF NEW YORK (State) Conservation dept

FOURTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

1914

DIVISION OF INLAND WATERS

ALBANY
J. B. LYON COMPANY, PRINTERS
1915

FOURTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

1914

TRANSMITTED TO THE LEGISLATURE JANUARY 15, 1915

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STATE OF NEW YORK

CONSERVATION COMMISSION

George E. Van Kennen, Ogdensburg John D. Moore, New York Patrick E. McCabe, Albany	*Commissioners*

James J. Fox, Brooklyn	*Deputy Commissioner*
Albert E. Hoyt, Albany	*Secretary to Commission*
John J. Farrell, Troy	*Assistant Secretary*
Richard W. Sherman, Utica	*Chief Engineer*
Matthew H. Hoover, Lockport	*Chief of Publication*

FOURTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

1914

ALBANY, N. Y., *January* 15, 1915

HON. EDWARD SCHOENECK, *Lieutenant Governor:*

HON. THADDEUS C. SWEET, *Speaker of the Assembly:*

GENTLEMEN.— Herewith in accordance with law we transmit to the Legislature our Fourth Annual Report.

Respectfully yours,

CONSERVATION COMMISSION
By ALBERT E. HOYT
Secretary to the Commission

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The Conservation Commission for the past fiscal year turned into the State Treasury $381,000. The commercial value of the product of State fish hatcheries and game farm was $215,000. Total, $596,000; total departmental expenditures, $640,000.

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STATE OF NEW YORK

No. 22

IN ASSEMBLY

JANUARY 18, 1915

FOURTH ANNUAL REPORT
OF THE
CONSERVATION COMMISSION

To the Legislature:

The near approach of a convention to revise the Constitution of the State must focus attention upon the major problems of conservation as never before.

The trend of legislation, not only at the session of 1915, but for years to come, will largely be determined by the debates of the Constitutional Convention and the popular discussions incident thereto.

Twenty-one years have elapsed since last the State of New York undertook a general revision of its organic law. Boys who were in the cradle then, are voters now. Ideas which were in their infancy then, are in their maturity now; on the other hand policies then considered wise, are now abandoned and forgotten. At the present juncture in the world's affairs, twenty-one years is a long time, and during such a period great changes occur in circumstance, in condition and in popular thought. Nowhere has this been more manifest than in the conservation movement; and nowhere is there greater opportunity for wise modification of the fundamental law than in relation to certain of the phases thereof.

At the same time, there are many aspects of conservation wherein the policy of the State is well defined and established; such, for example, as the protection and reproduction of the forests, and the protection and propagation of fish and game. The difficulties met in dealing with these phases of conservation are the everyday problems, first of finding the necessary money, and second, of using it with good judgment guided by the light of experience. The drawbacks along these lines are such as pertain to the whole State government. The calls upon the State for increased governmental activities are recurrent and numerous; but the people demand strict economy, and insist that the State must live within its means. To reconcile these conflicting demands is a problem requiring wise statesmanship; but it is not peculiar to the field of conservation.

CONSERVATION VIRTUALLY SELF-SUPPORTING

While the production of revenue is not the major purpose of the conservation movement, nevertheless the Conservation Commission collects large sums which go to aid the public treasury. For the fiscal year ending September 30, 1914, the total receipts of this Commission turned into the State Treasury amounted to $381,116.86. This is a record, our total receipts for 1913 having been $316,407.87; for 1912, $256,002.84, and for 1911, $258,226.65.

A conservative computation of the commercial value of the output of the fish hatcheries and the game farm, including brood stock, for the last fiscal year, would add $215,454.62 thereto.

In other words, the Conservation Commission produced last year direct revenues of $381,000 plus an indirect value of $215,000, making a total in money or its equivalent of $596,000, as against a total departmental expenditure for all purposes of $640,000. Judged by the tests which would be applied to a private business, conservation virtually supports itself.

I. THINGS ACHIEVED

Conservationists may congratulate themselves that some things are settled, and settled right.

Everybody to-day believes that the State's remaining wild life should be conserved, through the establishment of close seasons and the employment of an adequate protective force. Some may hold that there should be a longer open season for this species or a shorter open season for that, but upon the broad general principle of thorough and efficient protection of fish and game public sentiment is a unit and the policy of the State is not subject to change.

PROPAGATION OF FISH AND GAME

So too as to propagation of fish and game. The State is committed to the policy of establishing and operating sufficient fish hatcheries to restock its waters. In this line of endeavor New York is far ahead of any of the sister states; and within the past two years the Legislature has made appropriation for the extension thereof through the purchase and equipment of two new hatcheries. This Commission since its creation in 1911 has made every effort to increase the number and species of aquatic animals propagated from the various State hatcheries, and has on the average made a much greater distribution than ever before, reaching the maximum in 1913, when the total number distributed was 1,287,255,120. During the last fiscal year, with materially reduced funds for maintenance, but with additional hatchery activities imperatively required, we were able to propagate and distribute 566,543,016 fish.

Of the 1,287,255,120 hatchery output for 1913, 520,000,000 were edible blue crab fry. The year in question (1913) is the only one in which this species has been at all extensively propagated. In 1908 there was an output of 4,500,000 blue crab fry and 6,000 adults; in 1910, 56,000,000 fry and 7,500 adults; in 1912, 2,000 adults. The hatchery output for 1914 (566,543,016) was about five or six-sevenths of the normal output for the past four years.

The run of blue crabs is extremely variable; in 1913 it was phenomenal, while in 1914 it was not as great as usual.

The following tabular comparison shows the output of the State fish hatcheries for the four-year period beginning with 1911, and the four-year period immediately prior thereto:

Total output from State hatcheries:

1911	701,448,394
1912	730,434,933
1913	1,287,255,120
1914	566,543,016
Average output per annum, four years, 1911–1914	821,420,366
1907	250,656,600
1908	394,520,106
1909	530,277,221
1910	537,295,975
Average output per annum, four years, 1907–1910	428,187,476

The State game farm established some years ago in Chenango county has been remarkably successful. During the past fiscal year there were distributed therefrom 2,949 pheasants and 31,096 pheasant eggs. The Legislature of 1914 provided for the purchase and equipment of two new game farms, one to be located in Jefferson county, and one on Long Island. Land has been secured for the Jefferson county farm, and it will be in operation in the near future. For the proposed Long Island game farm the Commission has selected a tract of 139 acres in the town of Brookhaven, considered to be well adapted to the purpose. The Long Island game farm will, it is expected, be in operation by spring.

FIGHTING FOREST FIRES

Equally well established is the policy of the State in protecting its forests from fire and against trespass, or theft of timber. New York today protects against fire some 7,270,000 acres, of which the State owns 1,820,000. The system of fire protection now in operation in this State is thoroughly modern and effective. The installation of a chain of mountain observation stations, each having its watchman, equipped with telephone, has largely solved the problem. By detecting forest fires at their inception and communicating with the source of danger it is possible to overcome them before great loss can occur.

In 1914 the total number of mountain observation stations is	51
In 1910 the total number of mountain observation stations was	20
Increase in installation, 1911–1914, is	31

In other words, there are two and one-half times as many mountain observation stations installed today as there were four years ago. Of these 51 mountain stations, 49 were operated during the 1914 fire season.

The State has recently experienced three severe forest fire years, 1903, 1908 and 1913. The present up-to-date system of fighting forest fires was not installed until after the year 1908; therefore, the following table of comparison is germane as well as instructive:

	Damage caused by forest fires	Acres burned	Cost of extinguishing
1903	$864,082	464,189	$153,763 95
1908	802,135	368,072	189,661 51
1913	51,445	54,796	43,203 20

During the past year the total area burned by forest fires was 13,837 acres; total damage, $14,905; cost to extinguish, $13,978.18; total number of fires of all kinds, 413.

The question the mountain observation station must answer is, Does it detect fires in time to avert damage or greatly lessen it? In the light of experience, the answer must be affirmative. The system is no longer an experiment. It has stood the test; it has proved its worth.

The total number of fires reported in 1908 was 605; in 1913, 688. All fires discovered, no matter how small, were required to be reported in 1913; some small fires which burned less than an acre were not reported in 1908. There were more fires in 1913 than in 1908. There were seven-eighths as many railroad fires in 1913 as in 1908 — 78 as against 89. In the 89 railroad fires in 1908, the average acreage burned was 1,601 acres; average

COMPARISON OF FOREST FIRES, 1908 AND 1913

	YEAR			
	1908		1913	
Total number of fires	605		688	
Total area burned	368,072 acres		54,796 acres	
Average area per fire	608 acres		79 acres	
Total damage	$802,135		$51,445	
Damage per fire	$1,326		$75	
Total expenditures to extinguish	$189,661		$43,203	
Average cost to extinguish	$313		$63	
Area protected	8,443,760 acres		7,270,000 acres	
Per cent. of area burned	4.4 per cent		0.7 per cent	
Cost per acre for protection	2.2 cents		1.4 cents	
	No.	Area	No.	Area
Railroads caused	89	142,471 acres	78	260 acres
Hunters caused	100	75,212 acres	14	432 acres
Lightning caused	9	439 acres	26	17,254 acres
Fishermen caused	19	1,990 acres	120	15,683 acres

Note.—Minor fire causes not enumerated.

damage, $3,802. In the 78 railroad fires in 1913, the average acreage burned was three acres; average damage, $7. Oil-burning locomotives, which were not in use in 1908, were used on about a quarter of the mileage in the fire towns in 1913. The reduction in total area burned, from 368,072 acres in 1908 to 54,796 acres in 1913; from an average area per fire of 608 acres to 79 acres; from a total damage of $802,135 to $51,445; from an average damage per fire of $1,326 to $75; from a total cost to extinguish of $189,661 to $43,203; from an average cost per fire of $313 to $63; from a percentage of protected area burned of four and two-fifths per cent. to seven-tenths of one per cent.; from a cost per acre for protection of two and one-fifth cents to one and two-fifths cents — all this must largely be attributed to the improved methods of preventing and detecting forest fires employed in 1913, but not in use in 1908.

The mountain observation system is now in use by the United States government, in several of the States, and in Canada. Of the important States, New Jersey alone lacks a full equipment of mountain stations. New Jersey last fall suffered the destruction by fire of 200,000 acres — one tenth of its protected forest area.

USE OF OIL-BURNING LOCOMOTIVES REQUIRED

In March last, the New York Central and Hudson River Railroad Company petitioned the Public Service Commission for relief from an order made by that Commission on April 1, 1909, which required the use of oil-burning locomotives on day trains operated during the fire season upon the Adirondack lines. This petition was based upon grounds of economy, the railroad company alleging that to burn oil in its locomotives involved an increased expenditure per annum of about $90,000; furthermore, it was asserted that an improved type of coal-burning locomotive, perfected since 1909, could safely be relied upon to prevent the escape of sparks, coals, and cinders.

The granting of this application was strongly opposed by the Conservation Commission, with the co-operation of the Association for the Protection of the Adirondacks, the Empire State Forest Products Association, the International Paper Company, and others. It was demonstrated to the satisfaction of the Public Service Commission that in view of the disastrous results of railroad fires in the past, the public interests involved were too vast to permit of experiment, and that the preservation of the forests was of far greater moment than economy in railroad operation. The application was therefore denied.

PREVENTABLE FIRES

Statistics for the year 1913 are pertinent as indicating the damage done by preventable fires:

Fires caused by	Number of fires	Acres burned	Value of property destroyed
Smokers	224	7,539	$9,910
Fishermen	120	15,683	6,962
Campers	64	398	1,805
Hunters	14	432	217

The figures vary from year to year, but the proportion remains relatively the same. No statute, no order or regulation by a commission, can guard the forests against wanton carelessness; no vigilance of forest ranger or mountain observer can undo the mischief, once done.

Of all men, the camper, the hunter, or the fisherman, should be the last to put the great "popular playground" in jeopardy through preventable fires.

CONSERVATION IN HOLY WRIT

Among the judgments which the Lord commanded Moses to set before the chosen people, in the wilderness, was the following (Exodus xxii, 6):

> "If fire break out, and catch in thorns, so that the stacks of corn, or the standing corn, or the field, be consumed therewith, he that kindled the fire shall surely make restitution."

NEW YORK'S FOREST DOMAIN

Of the 1,820,000 acres of land owned by the State, and located chiefly in the Adirondack and Catskill Parks, about 769,139 acres were acquired by purchase, and the remainder chiefly by tax sales or by the direct appropriation thereof. Of the State's land holdings, about 70,000 acres are virgin forest; about 1,430,000 acres are cutover lands with commercially valuable tree growth; about 200,000 acres are lands under water, while the remaining 120,000 acres are waste and denuded lands.

Twenty million dollars would be a conservative estimate of the commercial value of New York's Forest Preserve.

FOREST REPRODUCTION

In order to conserve this vast forest domain for future generations to enjoy, the Conservation Commission has sought not only to reforest the waste and denuded lands owned by the State itself but to aid and encourage reforestation of privately owned lands adjacent thereto.

The advancement made in reforestation in this State during the period since the creation of the Conservation Commission, in 1911, may fairly be compared with the two four-year periods next preceding that year, as follows:

	1903-'6	1907-'10	1911-'14
Trees planted on State lands	577,955	1,341,205	2,636,650
Trees supplied for private planting	None	2,712,750	10,480,843
Trees given to State institutions	None	17,350	2,263,775

In less than four years the Conservation Commission has planted on denuded State lands about one and one-half times the total planted for eight years prior to its creation. Moreover, during the same period this Commission has supplied for the reforestation of private lands some 10,000,000 young forest trees, about four times the number furnished for that purpose in all the years prior to 1911.

During the past year the total number of trees planted on State land was 1,094,150; trees given to State institutions, 908,025; trees sold to private owners, 2,609,863.

There are today in our State tree nurseries 32,900,000 young trees, of which 10,000,000 are available for 1915 planting.

In regard to all this, the State policy is beyond peradventure settled; no one objects to the State's "going into the tree business"; not even the most pronounced individualist finds it too paternalistic or socialistic for the State to supply trees at cost to private owners and free of charge to State institutions.

During the past year the State has bought 1,711 acres of forest land. This purchase was an inheritance due to the final perfecting of title to tracts contracted for by our predecessors. The purchase of forest lands is today suspended, through lack of funds available therefor.

CUBA RESERVOIR

The Legislature, in 1913, committed to this department the administration of the Cuba Lake Reservoir in Allegany county, formerly a part of the canal system of the State. This commission has instituted a system of leasing lands adjacent to the reservoir for use as summer homes and for agricultural purposes and has received from the lessees a total of $2,642.20, of which $2,141.20 was received and turned into the State Treasury during the fiscal year covered by this report. It is our plan next spring to plant trees and make other betterments to this property which will not only improve its appearance but enhance its value.

TRESPASS ON STATE LAND

The great betterment of conditions as to trespass on State land and timber thievery cannot be more clearly shown than through tabular comparison covering the years just preceding, and the years subsequent to the creation of the Conservation Commission in 1911:

	Trespass cases reported	Computed value of material	Average damage per case
1909	83	$39,063 07	$470 64
1910	104	20,054 29	192 82
1911	46	1,499 20	32 59
1912	27	502 23	18 60
1913	16	2,008 25	125 51
1914	14	157 42	11 24

This unprecedented showing of removal by trespassers of less than two hundred dollars' worth of timber last year has not occurred by chance. It has been brought about by determined enforcement of the law and insistence on penalties. Today it may fairly be said that deliberate theft of State timber is a thing of the past. Practically all trespasses now arise through honest dispute over boundary lines. The day has gone by, let us hope never to return, when private interests could make comfortable arrangements with the State permitting them to cut off all the valuable timber on condition that they should leave the State in undisturbed possession of the denuded lands and the privilege of paying taxes and upkeep thereon.

A decision but lately made by the Court of Appeals in the famous Santa Clara land case, which had been in litigation for a decade, establishes the principle persistently asserted by this Commission, that the State cannot be divested of title to its forest lands save through the courts only; that no public official can stipulate or barter or give away the State's rights of ownership therein. This momentous decision should never be weakened, cheapened or surrendered through official complaisance or popular indifference or forgetfulness of the past.

PROTECTION OF FISH AND GAME

By chapter 312 of the Laws of 1912, a codification of the fish and game laws prepared by this Commission, the game protective force of the State was materially enlarged and strengthened. The total number of game protectors thereby provided was 125, an increase of thirty. Last year the Conservation Law was further amended so as to give twenty more game protectors, but the Legislature failed to make appropriation for the new men.

The reorganization made by this Commission has divided the State into twelve protective divisions, the protectors in each district to report to a division chief and he in turn, through the Chief Game Protector, to the Commission. One hundred regular game protectors and five fisheries protectors constitute the field force. While inadequate to police such a State as New York against violators of the Conservation Law, the protective field force has rendered efficient service, as shown by the following comparative figures:

	1911	1912	1913	1914
Cases prosecuted by protectors....	1485	1695	2622	2604
Successful prosecutions	1321	1499	2333	2296

It may be argued that number of arrests made by a game protector is not the ideal test of efficiency; in other words, that the desideratum is a condition wherein there would be no arrests, because none would be necessary. It may be argued, too, that "a little brief authority" sometimes makes men unreasonable and even tyrannical and that in given instances a game protector may have used his power arbitrarily, oppressively, or even corruptly.

Nevertheless, in this year of grace it will scarcely be maintained that if there were no arrests, it would mean that there were no lawbreakers; and the figures show so close an approximation of convictions to arrests as to disprove any allegation, if such there be, of extensive abuse of power by the game protectors. A jury may refuse to convict where an officer feels constrained to arrest.

ADDITIONAL PROTECTION

Among the new powers vested in the Conservation Commission by the Laws of 1912 was that of granting additional protection, beyond that given by the Conservation Law, to any species of fish or game, whenever disease, danger of extermination, or other like cause, may warrant such precautionary measures. The Commission has been frequently called upon to exercise this authority and by reason thereof has held numerous public hearings throughout the State which have demonstrated widespread popular interest in the problems of conservation.

At the present time (January, 1915) the following additional protection orders are in force and during the periods stated and in the localities severally named all taking is prohibited as to the species named:

SPECIES	County	Period	Expire
Pheasants	Herkimer	Two years	Oct. 1, 1916
Pheasants	Otsego	Two years	Oct. 1, 1916
Pheasants	Delaware	Two years	Oct. 1, 1916
Pheasants	Chenango	Two years	Oct. 1, 1916
Pheasants	Oneida	Two years	Oct. 1, 1916
Pheasants	Montgomery	Two years	Oct. 1, 1916
Pheasants	Lewis	Two years	Oct. 1, 1916
Pheasants	Washington	Two years	Oct. 1, 1916
Pheasants	Warren	Two years	Oct. 1, 1916
Pheasants	Schenectady	Two years	Oct. 1, 1916
Pheasants	St. Lawrence	Two years	Oct. 1, 1916
Pheasants	Franklin	Two years	Oct. 1, 1916
Pheasants	Clinton	Two years	Oct. 1, 1916
Pheasants	Essex	Two years	Oct. 1, 1916
Pheasants	Allegany	Two years	Oct. 1, 1915
Pheasants	Cattaraugus	Two years	Oct. 1, 1915
Pheasants	Chautauqua	Two years	Oct. 1, 1915
Pheasants	Tioga	Two years	Oct. 1, 1915
Ruffed grouse	Genesee	Two years	Oct. 1, 1916
Black, gray and fox squirrels	Genesee	Two years	Oct. 1, 1916
Cotton tail rabbits	Richmond	Oct. 1 to Nov. 14, and Jan. 1 to Jan. 31	In force until revoked
Black bass	Lake Erie and Niagara river.	June 16 to June 30	In force until revoked
Black bass	Schroon and Paradox lakes.	June 16 to July 15	June 15, 1917
Black bass	All waters in the towns of Chester, Horicon and Johnsburg, Warren Co.	June 16 to July 15	June 15, 1917
Pike and pike-perch	Butterfield Lake, Jefferson County	Tip-ups prohibited	Jan. 1, 1917
Bass, pike, pickerel, perch and bullheads.	Grass Lake, towns of Alexandria and Rossie, counties of St. Lawrence and Jefferson	Taking through the ice prohibited	Jan. 1, 1917

HUNTING ACCIDENTS

During the 1914 deer season, there were but five deer hunting accidents, three of which were fatal. Not one of these victims, so far as any evidence shows, was mistaken for a deer. Two killed were so mistaken in 1913, out of total hunting fatalities of nineteen that year. Seventeen minor hunting accidents occurred in 1914 in the pursuit of small game. The State of New York issues every year more than 200,000 licenses to hunt and pursue game and so far no law has been devised which limits or can limit the use of firearms to those who by experience, temperament and sobriety are at all times fit to use them, without peril to themselves and others. Taking these facts into account, this year's record as to hunting accidents might easily be worse. Nor is there reason to doubt that the so-called "buck law" has proved a conservator of human life and has averted many a tragedy of the North Woods.

OYSTER CULTURE, SANITARY INSPECTION, ETC.

This Commission is charged by law with specific duties of bacteriological inspection of shellfish grounds; but adequate performance thereof is impossible because of failure to make the needful appropriation therefor. By working with the oyster-growers and co-operating with them in securing, so far as may be, the elimination of sewage and other unwholesome conditions, and by collaborating with the public health departments of State and nation, we have been able to accomplish results alike for the oyster industry and the consumer. But we respectfully request the Legislature either to give us funds for bacteriological examinations, or, if such examinations are deemed unnecessary, to amend the law and do away with a situation unfair alike to the public, to this Commission, and to the oyster-growers, whereby we stand charged with grave responsibilities relative to the public health while denied the means requisite for the discharge thereof. The ultimate cost of such examinations, we may add, is imposed by statute upon the oyster industry and not upon the State.

The Conservation Commission through its Bureau of Marine Fisheries is engaged in making a systematic canvass among the oyster-growers to determine the number of men, number of boats, and amount of money engaged in the oyster industry in the State of New York. These facts, which will soon be collated, will be of great value for departmental purposes and will serve as a basis for constructive legislation.

An enormous and unprecedented set of young oysters on public lands at this time promises to yield a great revenue to the "free baymen." It is the duty of the Conservation Commission to safeguard the right of these "free baymen," as well as of the growers who have leased lands from the State.

We renew our recommendation previously made for the repeal of the archaic and conflicting legislative enactments, dating from 1866 to 1910, whereby certain towns in Long Island have been given the right to lease lands under water within the town limits. Practically all the Atlantic and Gulf states have done away with local regulation and established the principle of concentrated control by the State of the leasing of oyster lands. New York should not lag behind the sister states in this important matter.

The balance sheet of the Bureau of Marine Fisheries for the past fiscal year makes a good showing. Its receipts exceed those of 1913 by $6,403.89, and during the year 3,834.2 acres of oyster land have been leased, an increase over 1913 of 1,638.6 acres.

MIGRATORY BIRD LAW

We again urge that the State law and the federal regulations relative to migratory birds be made consistent with one another. Efforts to this end unfortunately failed in the closing hours of the last Legislature. Steps since taken by the United States authorities have measurably improved the situation, but there still remains conflict in certain particulars. This should not be. It needlessly confuses the law-abiding and affords a pretext to the lawless. The principle of federal protection to migratory birds is sound and undebatable and is everywhere accepted by true conservationists. The differences between the State law and the federal regulations are neither many nor difficult to reconcile.

APPORTIONMENT OF WATER SUPPLY

During the past year, increased activity in waterworks construction has resulted in a large number of applications to this Commission for approval of water supply projects. Frequent complaints as to rates and service, both of waterworks corporations and of municipalities, have continued to evince a popular demand for State supervision and regulation thereof.

One hundred sewerage and drainage projects, having received the approval of the State Department of Health, were submitted to this Commission for approval, the great majority whereof have been decided favorably.

The work of the Conservation Commission in equitably apportioning the State's water supply resources among the inhabitants thereof is briefly indicated by the table hereto annexed:

No.	NAME	Application filed	Disposition of application	Permit to operate
40	New York City-Suffolk county sources		Withdrawn Nov. 26, 1913	
109	Baldwin Water Company			Oct. 13, 1913
119	Village of Port Leyden			Nov. 25, 1913
122	Sodus water district			Dec. 16, 1913
125	Village of Brockport (temporary)			May 19, 1914
125	Village of Brockport (third supplemental application)	May 4, 1914	Approved May 18, 1914	
127	Madrid water district		Rejected May 16, 1914	
131	Village of West Winfield			Sept. 9, 1914
135	Village of Mexico (partial)			April 17, 1914
136	Marion water district			Sept. 25, 1914
138	Greenwich Union Water Works Co.			Sept. 9, 1914
142	Village of Bloomingdale		Pending	
144	City of Yonkers		Approved Nov. 7, 1913	
147	Village of Lisle		Pending	
148	Hamlin water district	Nov. 6, 1913	Approved Mar, 19, 1914	
149	Sylvan Spring Water Co.	Nov. 6, 1913	Approved Jan. 13, 1914	
150	Williamson water district	Dec. 4, 1913	Approved Dec. 31, 1913	
150	Williamson water district (supplemental application)	May 25, 1914	Approved June 1, 1914	
151	Clover street water district	Jan. 7, 1914	Approved Jan. 29, 1914	
152	City of Mount Vernon	Jan. 8, 1914	Pending	
153	Village of Sidney	Jan. 30, 1914	Pending	
154	Village of Centerville Station	Feb. 6, 1914	Approved May 18, 1914	
155	Village of Franklin	Feb. 13, 1914	Approved May 18, 1914	
156	Village of Franklinville	Feb. 16, 1914	Approved May 18, 1914	
157	Village of Morris	Feb. 24, 1914	Approved April 1, 1914	
158	Village of Arkport	Mar. 11, 1914	Approved May 18, 1914	
159	Sea Breeze water district	April 6, 1914	Approved May 19, 1914	
160	Village of Albion (second application)	April 28, 1914	Approved June 11, 1914	
161	Village of East Syracuse	May 7, 1914	Approved June 4, 1914	

No.	NAME	Application filed	Disposition of application	Permit to operate
162	Village of New Paltz	May 20, 1914	Approved June 5, 1914	
163	Monroe avenue water district	May 20, 1914	Approved June 11, 1914	
164	City of Watervliet	May 25, 1914	Pending	
165	Riverhead water district	June 2, 1914	Approved Sept. 8, 1914	
166	New York City-Schoharie sources	June 2, 1914	Pending	
167	Village of Lyons	June 8, 1914	Approved Aug. 20, 1914	
168	Varysburg Water Co., Inc	June 27, 1914	Approved Sept. 8, 1914	
169	Village of Naples	July 6, 1914	Pending	
170	Village of Wappingers Falls	July 21, 1914	Pending	
171	Village of Palmyra	Aug. 1, 1914	Approved Sept. 30, 1914	
172	Village of St. Johnsville	Aug. 14, 1914	Pending	
173	Town of Greece, Ridge Road water district	Aug. 22, 1914	Approved Sept. 29, 1914	
174	Village of Port Henry	Sept. 17, 1914	Pending	

UNION WATER DISTRICT PROJECTS

Acting under the provisions of chapter 233 of the Conservation Law, the cities of Cohoes and Watervliet, together with the village of Green Island and the town of Waterford, on June 23, 1913, organized the Charlton Union Water District. Thereupon the Commission through its chief engineer caused careful examinations and surveys to be made, and designed a gravity water supply system with filtration, together with maps, plans and estimates for a complete water supply, and on June 15, 1914, made its report to the Charlton Union Water District. The Commission is convinced that the best interests of the municipalities incorporated in the Charlton Union Water District would be subserved, as to their public water supply, by the carrying out of the Charlton Union Water District project. We believe that the provisions of the Conservation Law for Union Water Districts will be of very great value when its features are more generally understood.

STREAM SURVEYS

Power surveys have been made on the Saranac river, the Raquette river and the Schoharie creek, and partly as to the St. Regis river. It is intended to make a separate pamphlet report, on the lines of the Oswegatchie report published last year, as to each of these important streams, and also to include the same information in the bound annual reports of the Commission.

SUPERVISION OVER DOCKS AND DAMS

By an amendment to section 22 of the Conservation Law enacted in 1914, all the docks of the State, excepting those forming a part of the canal system and those under the jurisdiction of a dock department in cities of the first class, have been placed under the jurisdiction of the Commission. The necessity for this law became apparent when a dock at Eagle Park on Grand Island in the Niagara river failed, resulting in the drowning of a large number of persons. As the Legislature neglected to make appropriation for carrying out the provisions of the amended law as to docks, the Commission has been able to do but little in this direction.

The past year has been one of marked activity in the construction of dams. Plans and specifications for the construction or reconstruction of forty-nine such structures have been approved by the Commission. In a number of instances, before approval was granted, the Commission required changes in the plans and specifications submitted. The dams for which plans and specifications have been approved, with the date of approval, serial and location numbers, name of watershed, name of locality, name of owner and purpose of construction are as follows:

Date of approval	Serial number	Location number	Name of watershed	Name of locality	Name of owner	Purpose
Oct. 14, 1913	124	391	Oswegatchie river	Benson Mines	Benson Mines Co	Hydro-electric.
Oct. 20, 1913	102	555	Lake Erie	Gowanda	Keyes Electric Co	Hydro-electric.
Oct. 23, 1913	130	937	Upper Hudson river	Underwood	Wawonaissa club	Fish.
Oct. 30, 1913	133	131	Mohawk river	Schenectady	Board of Supervisors	Water supply.
Nov. 7, 1913	134	596	Lower Hudson river	Otisville	N. Y. City Health Dept	Water supply.
Nov. 7, 1913	135	690	Oswego river	Ithaca	H. J. Bool Furniture Co	Power.
Nov. 10, 1913	132	537	Lower Hudson river	Beacon	City of Beacon	Water supply.
Nov. 26, 1913	136	475	Delaware river	Lew Beach	Joshua M. Kelley	Power.
Nov. 26, 1913	137	330	Lower Hudson river	Chappaqua	New Castle Water Co	Water supply.
Nov. 26, 1913	139	391	Upper Hudson river	Gloversville	C. H. Masten	Ice.
Dec. 3, 1913	140	523	Delaware river	Arena	Holmes Milling Co	Power.
Dec. 3, 1913	141	391	Oswegatchie river	Oswegatchie	Benson Mines Co	Hydro-electric.
Dec. 16, 1913	127	683	Lake Champlain	Newman	J. & J. Rogers Co	Flooding.
Dec. 16, 1913	138	702	Lake Champlain	Upper Saranac	Bartlett Carry Realty Co	Hydro-electric.
Dec. 16, 1913	142	15	Mohawk river	Cohoes	Cohoes Co	Hydro-electric.
Jan. 6, 1914	128	388	Upper Hudson river	Glens Falls	International Paper Co	Power.
Jan. 7, 1914	129	403	Upper Hudson river	Hadley	Union Bag & Paper Co	Power.
Jan. 7, 1914	143	370	Lower Hudson river	Cortland	Syracuse Suburban Water Co	Water supply.
Feb. 2, 1914	144	948	Lower Hudson river	Edgewood	John B. Carey	Scenic.
Feb. 20, 1914	145	467	Mohawk river	Gilboa	Tri-County Light & Power Co	Hydro-electric.
Mar. 18, 1914	149	635	Lower Hudson river	Pine Bush	Edward R. Senn	Power.
Mar 19, 1914	146	292–A	Susquehanna river	Binghamton	City of Binghamton	Scenic.
Mar. 30, 1914	150	844	Susquehanna river	Hartwick	Louis E. Lake	Power.
April 1, 1914	147	726	Susquehanna river	Morris	Village of Morris	Water supply.
April 1, 1914	148	597	Chemung river	Hornell	Elmhurst Land Corporation	Scenic.
April 8, 1914	151	290	Lower Hudson river	Congers	St. Rita Lake Co	Pleasure.
April 8, 1914	152	722	Lower Hudson river	Ellenville	Dwight Divine & Sons	Power.
May 12, 1914	153	300	Raquette river	Pierrepont	Hannawa Falls Water Power Co	Power.
June 9, 1914	154	142	Salmon river	Altmar	Salmon River Power Development.	Power.

Date of approval	Serial number	Location number	Name of watershed	Name of locality	Name of owner	Purpose
June 9, 1914	155	505	Lower Hudson river	Westtown	Mrs. E. A. Gardner	Pleasure.
June 16, 1914	156	657	Susquehanna river	Gilbertsville	Joseph T. Gilbert	Water supply.
June 16, 1914	157	452	Susquehanna river	Center Village	Afton-Windsor Light, Heat & Power Co	Power.
June 16, 1914	158	142	Salmon river	Altmar	Salmon River Power Development	Power.
June 29, 1914	159	523-A	Lower Hudson river	Beacon	Town of Beacon	Water supply.
June 29, 1914	160	579	Lower Hudson river	Montgomery	Wm. Crabtree & Sons	Power.
July 10, 1914	161	64	Lake Champlain	Champlain	F. & J. R. Whiteside	Power.
July 16, 1914	162	1,009	Lower Hudson river	Hudson	City of Hudson	Water supply.
July 30, 1914	163	298	Mohawk river	Adirondack	Electric Power Corporation	Power.
July 30, 1914	164	394	Upper Hudson river	Hudson Falls	Union Bag & Paper Co	Power.
Aug. 27, 1914	168	715	Upper Hudson river	Indian Lake	G. F. Underwood	Logging.
Sept. 9, 1914	165	638	Oswego river	Trumansburg	Ovid Electric Co	Power.
Sept. 9, 1914	166	512	Mohawk river	Stewart's Landing	W. D. Watt Mfg. Co	Electric power.
Sept. 9, 1914	169	565	Upper Hudson river	Garnet	Frank H. Maxam	Fish.
Sept. 9, 1914	171	555	Oswego river	Locke	Nelson L. Drummond	Fish.
Sept. 9, 1914	173	389	Upper Hudson river	Hudson Falls	Union Bag & Paper Co	Power.
Sept. 21, 1914	172	356-A	Black river	Port Leyden	Homer E. Wilson	Hydro-electric.
Sept. 21, 1914	175	306	Lower Hudson river	Sloatsburg	Ramapo Mfg. Co	Pleasure.
Sept. 25, 1914	176	751	Lower Hudson river	Ellenville	Dwight Divine	Storage.
Sept. 25, 1914	177	564	Lake Champlain	Elizabethtown	Livingston Woodruff	Pleasure.

During the year improvements of twenty-four dams, by means of repairs, changes and alterations, have been required by the Commission. In the past twelve months only five dams have failed. Seventeen failed in 1913; twenty-two failed in 1912. Four of the dams which failed in the past year were built before the formation of the Conservation Commission. The remaining dam failed before completion, for the reason that precautions taken to protect it against high water during construction were inadequate. As soon as practicable, examination was made to ascertain the underlying cause of each failure and to obtain first-hand information which would avert similar casualties hereafter.

It is the purpose of the Commission to inspect and record the location and characteristics of every dam in the State, under its jurisdiction. The reports, when returned, are carefully examined and steps taken to correct any defect or weakness.

II. THINGS TO BE ACHIEVED

Thus far, in some detail, we have discussed the things achieved; the settled policies; the features of conservation upon which there is concord of opinion.

There remain to be discussed the things to be achieved; those great unsettled conservation problems as to which public opinion is still in the formative stage. These relate to conservation, development and utilization of water resources and the utilization of forest products.

Shall the Forest Preserve be "forever kept as wild forest lands?" or, shall the State permit selective cutting and sale of mature timber?

What shall the State do with the surplus waters of its canals? What shall we do with our million and a half of potential horse power, now undeveloped and unused?

Shall it be the good old policy of *laissez faire?* The flood of many a March has raced to the sea with ruin in its wake; the drouth of many an August has brought its sure heritage of industrial paralysis. But we are used to all this, and so were our fathers before us; why not our children, too?

The part which investigation could play in this drama has been played. All phases of the problem have been exhaustively investigated. Once that stage is reached, investigation means inaction and discussion means delay. The servant who buried his talent in the ground probably appointed a joint committee to investigate and report on the best way to utilize talents.

Precisely as the way to resume specie payment "was to resume," just so the way to stop wasting an energy equal to the annual consumption of 15,000,000 tons of coal is — to stop wasting it.

The time has come to act, and for good or ill, for years to come if not for all time, these great questions must now be answered.

Authority to control and regulate the material resources provided by nature is a necessary attribute of State sovereignty. The State should own and regulate the disposal of all additional water power it may create. It should make such utilization and disposal thereof as will promote the public health and public welfare, yield a public revenue, stimulate commerce and industry and cheapen the cost of light, heat and power.

NEW YORK'S WATER POWER RESOURCES

In the year 1907 the State Water Supply Commission was authorized and directed by the Legislature to devise a plan for the progressive development of the water powers of the State under State ownership, control and maintenance for the public use and benefit and for the increase of the public revenue. The same act directed the Commission to ascertain and report the water storage capacity of reservoirs created for the purpose of stream regulation, the record of rainfall, the average flow of the stream, and to estimate as nearly as practicable the water power capacity of proposed developments throughout the State.

Pursuant to this direction the State Water Supply Commission inaugurated an investigation of the power capacity and possibilities of the more important inland streams of the State. This work has been continued by its successor, the Conservation Commission. Comprehensive hydrographic surveys have been made of practically all the inland streams of our State, and we have at the present time reliable data showing the power possibilities of every important inland river within the State.

No State in the Union possesses greater water power resources than New York. The St. Lawrence river on the north and the Niagara river on the west furnish immense power possibilities. No river surpasses these in volume of water and none has a more uniform flow. We have in addition a large number of inland rivers capable of vast power development. Our extensive canal improvements have likewise created many useful water powers. It has been established by careful hydrographic surveys that within the borders of this State it is commercially feasible to develop at least two million five hundred thousand horse power (2,500,000 h. p.). This is more than sufficient to supply all the needs of the State for light and for power for manufacturing and industrial enterprises. Approximately one million (1,000,000) h. p. has already been developed. There remains, therefore, within the State in round numbers one million five hundred thousand (1,500,000) h. p. undeveloped.

The advancement in the art of electrical transmission has made this vast amount of potential energy available to the inhabitants of every municipality within the entire State. The prime importance of this resource lies in the fact that this latent power is located within the borders of a State containing a population of nearly ten millions (10,000,000) of inhabitants, and is available for our vast and varied industrial needs. It is valuable because it is in the very heart of commercial activities, where there is a growing market therefor.

Two vital questions arise with respect to the policy which the State should adopt regarding, first, the water powers already developed aggregating approximately one million (1,000,000) h. p.; second, the water powers yet undeveloped approximating one million five hundred thousand (1,500,000) h. p.

By reason of the fact that every stream contains developed as well as undeveloped power sites, these two questions are so interrelated that a discussion of one will in a large measure embrace the other.

With regard to our developed water powers all agree that these should be utilized to the highest degree of efficiency and the present capacity increased wherever possible, and if need be, the agency of the State employed to accomplish this result upon some basis which will be just and equitable to the State, the mill owner, and the citizen. Various plans have been suggested and strenuous efforts made to formulate a practical policy, which so far have largely failed by reason of legal obstacles or conflicting interests.

STREAM REGULATION

A very considerable part of our water powers are situate upon inland streams where at certain seasons there is a superabundance of water, and at other times a great deficiency exists. It is, therefore, apparent that if efficiency is to be secured, storage reservoirs which will provide a regulation of the stream flow are essential. This is of prime importance. By these means the developed powers will be greatly increased, and those undeveloped made more valuable and commercially attractive. Stream regulation is in fact one of the fundamental requirements of proper economical hydraulic development.

The construction of a reservoir on the Sacandaga at an estimated cost of five millions of dollars ($5,000,000) will increase the total low-water power of the Hudson river at the developed sites below Hadley from twenty-nine thousand four hundred and ninety (29,490) h. p. to ninety-one thousand three hundred (91,300) h. p.; and at undeveloped sites from eight thousand eight hundred and eighty-five (8,885) h. p. to sixty-one thousand five hundred (61,500) h. p. In other words, the low-water power of the stream will be increased nearly four times its present capacity. These figures include the power between the Sacandaga dam and Hadley, which will be thirty-four thousand five hundred (34,500) h. p. at the minimum. Moreover, in considering this project we must remember that the commercial value of stored water is greater than that from the ordinary flow of the stream, for the reason that the mill owners can use the same at a time when their mills would otherwise be idle, thereby enabling them to increase the capacity of their plants. By the construction of the Sacandaga reservoir and a proper regulation of the stream it would be possible for the mill owners to increase their plants about fifty per cent (50%) and still run them at full capacity for the same length of time that they do at present. The potential power possibilities at undeveloped sites would be similarly increased by the construction of this reservoir. The increase to the power-producing capacity of the Hudson by such regulation would amount to eighty-three thousand five hundred and sixty (83,500) h. p. Similar results would follow on the Genesee, Black, Raquette, Oswegatchie and Saranac rivers, as appears from the following table:

INCREASE IN ECONOMIC CAPACITY OF VARIOUS STREAMS OBTAINABLE BY REGULATION

RIVER	PRESENT CONDITIONS				Regulation by	CONDITIONS AFTER REGULATION							
	HORSE-POWER AVAILABLE WITH LOW WATER FLOW		HORSE-POWER CAPACITY OF TURBINES FOR 24-HOUR CONTINUOUS POWER, 60 PER CENT. OF AVERAGE YEAR			HORSE-POWER AVAILABLE WITH LOW WATER FLOW		INCREASE OF LOW WATER POWER		HORSE-POWER CAPACITY OF TURBINES FOR 24-HOUR CONTINUOUS POWER, 60 PER CENT. OF AVERAGE YEAR		Total increase in economic capacity of stream	Estimated cost of reservoirs
	At developed sites	At undeveloped sites	At developed sites	At undeveloped sites		At developed sites	At undeveloped sites	At developed sites	At undeveloped sites	At developed sites	At undeveloped sites		
Hudson, between Hadley and Troy (including power from Sacandaga between dam and Hadley).	29,490	8,885	123,690	44,700	Sacandaga reservoir, 28.8 bil. cu. ft. regulated for Hadley.	91,300	61,500	61,810	52,615	163,600	88,350	83,560	4,661,000
Genesee, between Portage and Lake Ontario.	6,394	4,305	30,209	32,370	Portage reservoir, 13.4 bil. cu. ft. regulated for Portage.	27,987	46,040	21,593	41,735	38,760	55,190	31,371	4,588,000
Black, between Higley, Mt. reservoir and Lake Ontario.	36,517	5,591	111,663	16,860	Higley Mt. reservoir, 5.2 bil. cu. ft. regulated for dam site.	58,775	17,675	22,258	12,084	122,870	26,950	21,297	1,340,000
Raquette, between Tupper Lake and the St. Lawrence river.	4,654	14,079	26,890	83,770	Oxbow reservoir, 11.4 bil. cu. ft. regulated for Piercefield	22,380	73,430	17,726	59,351	36,300	116,500	42,140	*2,000,000
Oswegatchie, between Newton Falls and the St. Lawrence river.	7,160	2,524	29,429	10,668	Cranberry Lake, Newton Falls and Harrisville reservoirs — Total of 11.0 bil. cu. ft.	26,974	24,808	19,814	22,284	41,508	37,712	39,123	1,518,000
Saranac, between Saranac Lake and Lake Champlain.	5,599	6,172	18,246	20,607	Saranac Lake reservoir, 4.0 bil cu. ft.	16,316	20,129	10,717	13,957	23,938	27,015	12,100	†600,000
Total for six rivers above....	89,814	41,556	340,127	208,975	73 8 bil. cu. ft...........	243,732	243,582	153,918	202,026	426,976	351,717	229,591	14,707,000

* Provisional. † Provisional only.

A study of the foregoing tabulation will show the great benefits of stream regulation in connection with the development of power.

Public Health, Safety, and Welfare

The increase of power is by no means the only benefit which will flow from stream regulation. The construction of reservoirs will impound spring flood waters which so frequently result in great injury to public and private property along our inland streams. The Sacandaga reservoir will remove at least three (3) feet from the crest of the floods at Troy, Albany, and elsewhere along the Hudson. The Portage reservoir on the Genesee will prevent the overflow of thousands of acres of valuable land in the Genesee valley and also eliminate injury to other public and private property along the stream which in the past has so often been endangered or destroyed. This menace to property is present every recurring season. No figures are available to estimate the enormous loss of property injured or destroyed by Spring freshets in this State. By proper stream regulation this destruction and waste would be greatly minimized if not wholly prevented. Like safety to property will result on the other inland rivers if properly regulated. Moreover, stream regulation will produce a more steady and continuous run of water. It will increase the flow during the dry season of the year, and convert many stagnant pools into streams of living, flowing water. Public health, safety and welfare will be greatly benefited and improved thereby.

In determining a policy for the State to adopt with respect to stream regulation, consideration should be given to the relative importance of these advantages to the beneficiaries thereof. It may be difficult, if not impossible, to estimate the full value of the benefits to the health, safety and welfare of the public. Yet in formulating an equitable plan for stream regulation all benefits accruing therefrom should be considered: first, to the mill owner from increased power; second, to the citizenry generally from the improvement to public health, the advancement of public welfare, and the safety to public and private property.

Benefit to Mill Owner from Increase of Power

It is generally conceded that the benefit to the mill owner derived from the increase of power is by far the more important. In order to secure proper regulation reservoirs must be constructed, maintained and operated. How shall these be constructed, and the cost thereof be paid? Shall the State as a whole contribute toward the expense of construction, maintenance and operation, on account of these benefits to public health, safety and welfare?

If the policy of stream regulation were made general throughout the State the benefits derived therefrom would directly or indirectly reach our entire population; and there seems, therefore, no just or equitable reason why the State as a whole should not contribute toward the cost of such development.

With regard to these questions we find that the Constitution provides that

> "The Legislature may by general laws provide for the use of not exceeding three percentum of such lands for the construction and maintenance of reservoirs for municipal water supply, for the canals of the State and to regulate the flow of streams. Such reservoirs shall be constructed, owned and controlled by the State, but such work shall not be undertaken until after the boundaries and high flow lines thereof shall have been accurately surveyed and fixed, and after public notice, hearing and determination that such lands are required for such public use. The expense of any such improvements shall be apportioned on the public and private property and municipalities benefited to the extent of the benefits received. Any such reservoir shall always be operated by the State and the Legislature shall provide for a charge upon the property and municipalities benefited for a reasonable return to the State upon the value of the rights and property of the State used and the services of the State rendered, which shall be fixed for terms of not exceeding ten years and be readjustable at the end of any term."

This provision of the Constitution is applicable to a very large proportion of our inland streams, which have their source in the Forest Preserve counties; and the fair inference is that the people of the State favor the construction, control, maintenance and operation of such reservoirs through the agency of the State itself.

Cost to Be Borne by the State and by the Owner

We feel, therefore, that the proper policy to adopt is for the State to construct, control, maintain and operate reservoirs intended for stream regulation, and that the cost thereof be borne in part by the State and its municipalities benefited thereby, and in part by the owners of water power sites upon some basis of a just and equitable division thereof.

With regard to the payment to be made by the mill owners, serious and difficult questions arise. How shall such payment be made and provided for? Many divergent views are entertained with respect to these questions. All practically agree that the beneficiaries should be required to pay therefor. Some maintain that the real beneficiaries are the owners of power sites already developed. This view is predicated upon the proposition that undeveloped sites have no use for an increase of power which will result from stream regulation. It is also claimed, in some cases, that the owners of developed sites should not be required to contribute toward the cost of the construction, maintenance or operation of such reservoirs, for the reason that some power owners have no need for additional or increased power. These views are, of course, erroneous, for the reason that any increase in the capacity of a water power site, whether developed or undeveloped, enhances its potential value. Moreover, while the assessment of cost upon developed powers alone might possibly answer the needs and be practical for a river like the Black, where more than 85 per cent. of its available power is developed, it would utterly and absolutely fail to secure any regulation on rivers like the Raquette, where less than 25 per cent. of the available power is developed.

A glance at the foregoing table shows that the regulation of the Raquette could not and would not be made if the developed sites alone were required to pay the cost for the evident reason that the owners of such sites could not afford to bear the burden. For example, if the reservoir at the Oxbow on the Raquette river were built at the estimated cost of two millions of dollars ($2,000,000), the construction cost would be at the rate of twenty-five dollars and ninety-seven cents ($25.97) per h. p., based upon an increase of 77,077 h. p. in the low-water power of the stream. If this cost were apportioned between the developed and undeveloped sites, then four hundred sixty thousand dollars ($460,000) would be due from the owners of developed sites and one million five hundred and forty dollars ($1,540,000) from the owners of undeveloped sites. If the entire two million dollars ($2,000,000) were assessed against the developed sites alone the charge would be at the rate of one hundred and twelve dollars ($112) per horse power. Such charge, with the cost of maintenance and operation, would be prohibitive and manifestly unfair, for the reason that the value of the undeveloped water powers would be increased by such regulation. It is apparent, therefore, that if the State aims to formulate a workable policy which will result in the general regulation of all our inland streams, some plan must be devised whereby the owners of undeveloped as well as developed powers will be compelled to bear their just and equitable share of the cost of such improvement. Inasmuch as the owners of unused and unsalable power sites would rarely if ever agree voluntarily to share the cost of such a project, it follows that a workable policy must involve compulsory payment. No provision for voluntary payment will suffice.

Power of Eminent Domain Involved

To achieve this result by legislation a valid power of taxation must be invoked, and legislation must likewise carry with it the power of eminent domain, for the reason that every project for the construction of reservoirs involves the acquisition of private property, and in some cases public property as well. No practical plan has yet been suggested which does not involve the exercise of these two sovereign powers.

For the regulation of streams, reservoirs must be constructed and private lands must be acquired as above stated. The cost of construction, maintenance and operation must be paid. Neither public nor private property can be appropriated; nor can the power of taxation be considered in this State except for a public purpose. Neither the right of eminent domain, nor the power of taxation has been given to mill owners in this State to acquire private property for milling purposes. Nor has the enforcement of assessments for benefits derived been permitted for the development and improvement of water powers exclusive of other purposes of a public nature. These projects have always been considered private enterprises, and therefore the power of eminent domain and taxation has been denied. We believe that it will be generally conceded that this view is correct, and therefore any legislative plan designed to achieve practical results must embrace the valid power of eminent domain and taxation as well. To accomplish this the primary purpose of the statute must be public, not private.

The development of water powers and the improvement thereof by stream regulation for the production of energy for lighting public buildings, streets and highways, and for power for State, municipal and public service uses, and incidentally for industrial enterprises, would, we think, be construed to be a sufficient public purpose to validate the exercise of the necessary powers of eminent domain and taxation.

To accomplish the purposes named provision for the transmission of energy produced is essential; and moreover, this would furnish a market for power available from sites now undeveloped and the development thereof would be made practical and feasible for the reason that the same could then be used for commercial and industrial purposes, where at present no market exists. Unless some such plan is adopted to furnish a market for the power available from undeveloped sites the burden of taxation for stream regulation imposed upon unused powers would be unjust to the owners and tend to confiscation of their property.

Undeveloped Powers, Owned and Controlled by the State

Thus far we have considered stream regulation on rivers where water powers are privately owned. We will now consider the proper policy to be adopted with respect to undeveloped water powers owned and controlled by the State itself.

More than three-fourths of the undeveloped water power within the borders of the State of New York is owned and controlled by the State itself. It is the owner of the bed of the stream beneath the waters of the St. Lawrence and Niagara rivers, and is likewise the riparian owner of lands adjacent to a large amount of available power, and it has also created much available power through the construction of its canal system. With respect to the large navigable streams the State has full jurisdiction and control over the same, subject only to the paramount right of the Federal Government to control the same in the interests of navigation. It likewise has jurisdiction over our inland rivers to the extent that the waters therein cannot be diverted for power purposes, or the flow thereof obstructed without the authority and consent of the State. No person can be said to own the water which flows in these streams. All persons have a limited right to the use thereof, dependent upon the purposes for which the same is to be employed. These rivers are considered highways for the use of the public. The riparian owners are powerless to exclude the public from the use thereof for such and other purposes. It is for this and other reasons that the water powers of the State have come to be regarded as a natural public resource. Any State policy with respect to the utilization thereof must recognize the rights of the public therein and reckon with this established sentiment.

So far the State has established no definite policy with respect to its water powers. From time to time it has granted to private individuals the right to divert water for private purposes. There is a growing sentiment opposed to such grants. The people of the State are beginning to realize that these vast resources are too valuable to be given away. The exploitation of water powers by private persons is no longer regarded with favor. The people feel they have not received adequate benefits from the grants that have been heretofore made.

The Conservation Commission, mindful of the fact that the Legislature has imposed upon it the duty of devising "plans for the progressive development of the water powers of the State under State ownership, control and maintenance for the public use and benefit, and for the increase of the public revenue," has advocated that the State itself develop its unused water powers and distribute the energy produced thereby direct to the people at the cost of production and transmission.

So far the recommendations of our Commission have not been adopted for the reason that it has been impossible to reconcile conflicting interests. Many people believe that the policy of the development of the water powers of the State "under State ownership, control and maintenance," foreshadowed by the Legislature in 1907, is not sound; but that the development and exploitation of our water power resources should be left to private initiative. Whether the sorely needed development of our water power shall proceed under public or private auspices is a question so vital to the welfare of the State that it deserves your most earnest and thoughtful attention.

UTILIZATION OF FORESTS

Wise men in their day and generation, prudent and foreseeing, were the framers of the Constitution of 1894, when they excluded from the Forest Preserve — forever, as they then believed — the axe and the saw and decreed that it be "kept as wild lands." In the face of what had notoriously happened, and judging the future by the only test, the light of experience, there was nothing else for them to do but what they did. The money-changers were to be driven from the temple; conscienceless exploitation of the forests was to be checked. All this was timely and provident.

The time has come, however, when modifications of this drastic policy may safely be considered. We now know — the scientific forester of our time tells us — what was not appreciated twenty years ago, that selective cutting and removal of ripe timber is beneficial to the forests, apart from lessening the fire danger.

With a timber cut in this State five times the annual growth, and consumption sixteen times the growth, the State of New York ought to consider, seriously, a plan of classifying the Forest Preserve by areas, part to be protective and part to be productive. By confining cutting to selected trees under State supervision, and conducting all sales thereof by competitive bidding, such forest utilization would yield a direct revenue to the State treasury of $1,000,000 per annum. The fixed carrying charges on the Forest Preserve are $365,000 per annum, of which $200,000 is for interest and $150,000 for taxes; in other words, the utilization of ripe timber would yield a net annual income of $635,000 over and above all fixed charges.

We therefore reaffirm our support for the constitutional amendment approved by the Legislature of 1913, which would permit the removal of ripe timber, as well as dead and down timber, and the leasing of camp-sites in the Forest Preserve. The latter measure, while yielding a considerable annual revenue, would tend to make the camper a vigilant fire-fighter, for he would be watching his own property as well as the State's.

The utmost care and precaution, the greatest vigilance in administration, will be required to protect such a plan of forest utilization against gross abuse. Already there are signs that certain interests not unknown to forest exploitation are willing to take an intelligent advisory part in arranging to reorganize the administration of the State's forestry interests.

A TRIPARTITE DEPARTMENT

The Conservation Commission exercises and administers under one head all the powers, duties, and functions formerly divided among several departments — the Forest, Fish and Game Commission, the State Water Supply Commission, the Forest Purchasing Board, and the Commissioners of Water Power on Black River — together with new and important additions thereto, notably along the line of perfecting " a comprehensive system for the entire State, for the conservation, development, regulation and use of the waters in each of the principal watersheds of the State." The plan of organization is that of a tripartite department, with three divisions each charged with duties relating to one of the three great phases of conservation, to lands and forests, to fish and game, or to inland waters, with three commissioners reviewing and passing upon all the great questions of policy in detail and blending them in one harmonious, progressive whole.

There are those who would return to the old days when the forests, the fish and game, and the water resources of the State were committed to separate departments, just as there are those who would return to the old days when each few miles of railroad had its separate organization and a distinct entity and was operated all by itself with slight regard to transportation as a national and world system. Or there may be those who would like the stagecoach even better, for they knew the driver long and well and he was an agreeable man, and they felt a closeness of touch, a communion of spirit, and a personal intimacy with him, not attainable by travelers in our day.

That the State of New York will ever "unscramble the eggs" or go back to conservation piecemeal — forestry here, fish and game there, water resources yonder, a course meal served at three dining-rooms — is unthinkable. These great problems of conservation are indissolubly interrelated; the forest and the waters interblend and depend the one upon the other, and the fish and game upon both.

What is needed is not a separation but a closer fusion; a completer oneness; a more thorough understanding of the finality of the union; better relations, and better directed energy upon the part of all conservationists, no matter which branch of the great movement may claim their peculiar allegiance.

One man may achieve much in administrative conservation. Three men should bring to the task a threefold intelligence, correcting each other's point of view, and minimizing the danger of error, or worse.

One man may unwittingly, through environment or from other cause, become susceptible to influences inimical to the preservation of the forest; may yield to its exploitation by private interest, against the public weal. The chance that three men can be so influenced is less than one-third as great.

One Commissioner — a single head — might once again be persuaded to stipulate away the State's right and title to its forest lands. That three Commissioners could be so persuaded is more than thrice as unlikely.

All of which is respectfully submitted.

GEORGE E. VAN KENNEN
JOHN D. MOORE
PATRICK E. McCABE
Commissioners

ALBANY, N. Y., *January* 15, 1915.

WHY COMMISSIONER McCABE DIFFERS FROM HIS COLLEAGUES

It isn't pleasant for me to differ from my colleagues in the Conservation Commission on the hydro power question, but I do not believe that any good can come out of a public situation which is encouraged in order that harmony may prevail. On the contrary, I believe that the only hope of perfecting this condition, or lifting it out of the rut in which it is, is more likely to be brought about by a broad, intelligent discussion of our differences.

There is nothing quite so baneful in unsettled public affairs as harmony, and harmony in this situation would be purchased at the price of my honest convictions, and this, I know, would not meet with the approbation of my fellow Commissioners, who are always solicitously seeking the truth in all public questions.

The time that I have been able to give to this water power question since I have taken office as Conservation Commissioner has been altogether too limited to make a thorough examination of the matter. However, it seems to me the State is entitled to know the result of my observations and reading, even though my deductions be wrong.

Of the many problems in this department the most mooted and, at the same time, the most vexatious one, and the one in which the least progress has been made, is the solution of the water power question. The literature on the subject, so far as I have been able to ascertain, consists principally of the reports of two sets of engineers who have made a sort of public shuttlecock of the question, one side contending that certain conditions were true and lugging in column after column of figures to aid or prove their contention, while the opposing forces massed as many, if not more, figures to confirm the correctness of their position, and both sides were ostensibly satisfied so long as nothing was done.

Germany and Canada seem to be much quoted as to the success and failure of governmental operation of public utilities by hydro power in these countries. It is difficult to understand the quoting of conditions in foreign countries to prove the possibilities of a situation here. There is an element of politics in all public questions in this country which has no place in the affairs of foreign countries, and which makes it impossible for this country to compete in a commercial enterprise with private corporations. Trying to operate a commercial enterprise successfully in this country with political help is trying the impossible. Politics has its rules and provinces outside of which it cannot successfully venture; too few seem to understand this principle. A great many men would make politics of everything, and as many more would make business of everything. One can also find marshalled any number of municipalities in this country to prove and disprove the success and failure of municipal ownership.

We find in this matter, as in all matters of dispute on public questions, a difference as to what the State Constitution intends: one side invoking section 7 of article 7 of the State Constitution to prove that the State and the State only can engage in the development of this hydro-electric power; while the opposing party vigorously maintain, under this same constitutional provision, that the State may enter into the construction and maintenance of reservoirs, etc., for three specific purposes and these only: First, to regulate the flow of streams; secondly, for municipal water supply; and thirdly, for the canals of the State; that this provision of the Constitution in nowise provides for the hydro-electrical development of the water powers. So much for the constitutionality of the question.

Some persons affect to believe that the State should engage in the development and sale of this great power as a permanent business for the purpose of producing a commodity in which there would be a good commercial profit. To me it is positively incredible how any person versed in the ways of public affairs can entertain for a moment any such impracticable theory. The advocates of this speculation with whom I consulted seemed more concerned in preventing the development of our water power by rich men than they did in enriching the State or relieving the already overburdened tax payers. Many of these persons are opposed to the consummation of all public affairs and naively rest their position on their interest in and protection of the poor man's rights. So far, this side of the matter has been a sort of political question, made so by those self-constituted representatives of the people who carry on a kind of political blackmail against those who differ from them on public questions of this character. These men are not of the best citizens, nor of the most intelligent, but they are most ingenious in their method of advertising and of ingratiating themselves as the self-sacrificing friends of those who plow and those who spin.

Many politicians, or, rather, men in public life, yield to the menacing of the supporters of this idea, more fearful of their personal safety in public office than in the soundness of the position into which they are forced. Courage is at the bottom of all big successes. No important success ever comes to one who fears failure. The merits or demerits of the water power question are never entered into as a matter of government by those persons; the logic or philosophy of the events surrounding the situation are in nowise considered.

However, I, myself, do not believe that this is a question which engineers can settle. At the outset they were necessary to prove the volume of water and its generative power, but that has been determined over and over again. This was the first step and no second step has ever been taken. The question has been, as it were, marking time.

In public matters delay has its full quota of contributory causes; namely, weakness in men, lack of decision and confidence, fear of responsibility, inefficiency, procrastination, want of capacity, poor in courage and the thousand-and-one other apprehensions which beset the way of the wrong man. Protracted delay is the greatest of all evils. In my judgment, a procrastinating administration is worse and more expensive than a vitiated administration. The restraints of some administrations are as bad as the extravagances of others. Consequently, the delay attending this power question is the most pernicious wrong possible to the State. So, also, should a policy of devolution be avoided at this time.

It is high time that another step was taken toward the solution of this question, and no other step can or will be taken without courage — a courage that rises above the fear of the poor man's political support, the vagaries of which mean nothing, as well as above the hope of the rich man's favor, which is as barren as the favor of princes.

If this problem is to be properly adjusted the underbrush must be first cleared away; all this prating about the poor man must be eliminated; and the cant and hypocricy of the self-elected guardians of the people must be expelled from the subject, as well as the influence of the politician who curries favor at any price.

Honest or just legislation is for the whole people, rich and poor alike. There is no benefit in such things for one man over another, and to induce persons to lend themselves to any public movement, with the promise and expectancy of bettering their condition, particularly if they are poor, is deception of the very worst type.

But I do not believe the poor man is so easily fooled as the professional ranter thinks. For years I have been listening to the lamentations of the professional supporters and defenders of the poor man, asking and receiving legislation in his behalf; and year after year the poor man's condition is no better. Some poor men rise to affluence in spite of their poverty, while other poor men fail terribly notwithstanding rare mental attainments.

There is a something at work in each man's life which has more to do with shaping his course and fixing his position in the world than the operation of officials at the Capitol. Petty agitators still indulge in the fallacious idea of being able to trick the people into believing they can get something for nothing.

No progress has been made in the graduation of this question because of the misapplied rules and wrong principles engaged. It is my opinion that it is a misunderstanding of the logic of the commercial situation surrounding this question which is responsible for a great deal of the tinkering which has been going on for the last several years. Because the State owns the water is no reason why Tom, Dick and Harry should be allowed to experiment at the cost of the people, or why it should engage in the business of hydro development — not at all. There are some things the State can do, such as approximating values of estates — real and personal — levying and collecting taxes and disbursing the cost of operation, etc.; and there are also some things the State cannot do, and one of them is to engage successfully in a commercial enterprise. It is too true that a question in astronomy cannot be settled by applying the laws of philosophy.

This is a big question and must, of necessity, be settled by big men whose business it is to commercialize water power. Little men cannot settle it at all, nor can a man big in other ways settle it. The average man will read nothing which interferes with his prejudices. This hydro question must be settled by a man of genius; one who loves his work; a man who can bring to his assistance the support and confidence of the wealth necessary to consummate the undertaking. They of little faith are impregnate with doubt and fear, which is always a hindrance; and he who assumes to fulfill a contract for the government which requires vigor and skill must expect the denunciation of those of little heart — and they are legion. Self-reliance, courage, decision and brains are the qualities necessary for a bold project. Men with these elements cannot work tied with the red tape preventives thought necessary to protect the State in its public exploitations. To appoint one in the public service to a position of grave responsibility is not difficult, nor is it regarded as a hardship to accept the appointment and collect the salary; but to render services in keeping with the responsibility of an important office and proportionate to a good salary is not at all common.

This is a business question pure and simple, and must, if settled right, be settled by the rules of business. Think of having something to sell; you won't sell it to a rich man and a poor man can't buy it. The result is you must keep it — which is the case in this affair. If the price of the water power of the State could be brought within the reach of a poor man, every poor man in the State would claim and want it. It is for this reason, and upon this principle, that franchises are given to the highest, not the lowest, bidder.

When the State receives all a privilege is worth, everyone in the State is more or less benefited; whereas, if the same benefit is conferred upon one for the smallest possible pittance, everyone in the State is more or less wronged.

I am unalterably opposed to the State contributing to the support of any man's business at the expense of the citizenship of New York. The theory of State ownership is alien to our form of government — there is no doubt about this. It is a method wherein the State moneys of all the people are ventured in hopes that about one-quarter of the people may profit. The State has something to sell, certain water powers which are said to be of great value, and in the disposing of these rights it must proceed along the simple lines which business follows in all such matters;

it must offer them for sale in the market where such privileges are sold and brought under such laws and regulations which may be necessary to protect the State from a purchaser who may be inclined to deceive or wrong the State for himself. Ability for the construction and organization necessary to make a project of this magnitude a success is given to few men, and entrusting those outside of the limited circle with the disentangling of the complex elements of this plan is not the part of either sense or wisdom.

The great danger the future holds for the State, if some action is not taken now, is the refusal of the proper interests to enter into the scheme. Such things cannot be deferred too long without loss to those who hold a marketable affair until the anxious become indifferent and the wealth necessary for the project seeks an investment in quarters more tranquil and not froth with the instability which surrounds the public contracts and franchises of today.

Whether the water privileges are as desirable now as they were several years ago I do not know. Experimenting may have proved otherwise. However, I believe if certain persons can be induced to enter this field of enterprise success will attend their endeavors, out of which the State will profit greatly. The State will be as much concerned in the success of the undertaking as those who make possible the scheme. The greater the success the greater the value of the State water rights and the greater the profits accruing to the taxpayers; where failure to the enterprise means valueless water rights to the State.

It would seem an easy matter to draft a bill calling for the highest or greatest development of all the water power of the State in which the regulations surrounding and protecting the rights of the people should be drawn with an eye for a commensurate return to the State, in keeping with the power generated out of the waters of the State. To obtain the full commercial value of the privilege bestowed will prove the most important, as well as the most difficult, part of the transaction and, of necessity, must be adjusted by men who are seeking no political favors nor building for a public future. So, also, must the men entrusted to represent the State in these negotiations stand away outside of the influence of the corporations concerned.

I believe a measure can be drafted protecting to the fullest every interest of the State and, at the same time, not to embarrass the contractor with fear and trepidation sufficient to paralyze his best efforts. Success for one is success for both, while failure for one is failure for both. Let another step be taken. Allow the criminal waste of the valuable water power of the State to go no further. Nothing has been done, no progress has been made and no move forward can be made along the old lines — if it could have been it would have been.

The reports on this subject, after the first ones on both sides, seem very much like the rethreshing of old straw.

PATRICK E. McCABE
Conservation Commissioner

REPORT OF CONSERVATION BUREAU, ATTORNEY-GENERAL'S OFFICE, RELATIVE TO LITIGATIONS

Pursuant to the provisions of section 9 of chapter 647 of the Laws of 1911, the Conservation Commission transmitted to the Attorney-General all orders to bring actions, suits and proceedings which the Commission was authorized to institute and maintain, and requested the Attorney-General to defend them.

At the beginning of the year 1914 there were pending eighty-seven actions, the majority of which involved title to lands in the Forest Preserve of the State of New York. These were actions transferred to the Conservation Bureau of the Attorney-General's office from the Legal Department of the former Forest, Fish and Game Commission and were awaiting trial. During the year 1914 all pending actions involving title were disposed of by trial, and of these, fifty-five were tried before Hon. Irving G. Vann as official referee.

These fifty-five actions involved title to lands in Township 15, Totten and Crossfield's Purchase, Hamilton county, the majority of which were brought in 1907. The lands involved were purchased by the State from the Indian River Company and subsequently it appeared that at the time of purchase there were many occupants of these lands claiming adversely to the Indian River Company and its grantee, the State. The rights of the respective parties were determined upon the trial of these cases and where the State failed in title, the Indian River Company, under the terms of its deed, will be obliged to reimburse the State.

During the past year four actions, brought in 1910 against the Santa Clara Lumber Company and George N. Ostrander and others, were argued in the Court of Appeals, and that court rendered its decision in an important action involving a question of title and the right of the Forest, Fish and Game Commissioner to enter into a stipulation permitting judgment to be taken against the State, thereby adjudicating the defendants to be the owners of the land in dispute. While the State had been unsuccessful in the lower courts, the Court of Appeals by unanimous decision reversed the judgment and directed a new trial of this action.

The determination of the vital question, namely the power of the Forest, Fish and Game Commissioner to stipulate that judgment could be taken against the State adjudicating the defendant as the owner of lands within the Forest Preserve, necessarily and materially affects a number of similar cases where the same question is involved. The decision does not go to the good faith of the transaction but rests entirely upon the lack of power conferred upon the Commissioner, particularly in view of the constitutional prohibition of alienation of State lands within the Forest Preserve. The land involved in the action which has been sent back for a new trial consists of about 2,100 acres lying north of Township 50, in Hamilton and Essex counties, and upon which land the soft wood timber had been removed. Should it be finally determined that the State owned the land at the time the judgment was permitted to be taken, the defendants will be required to pay the damages incurred by the taking of the same.

Following the decision just referred to, Justice Borst has rendered a decision involving a similar transaction with the Forest, Fish and Game Commissioner and the Raquette Falls Land Company. The lands in question are located in Township 12, Old Military Tract, Essex county, and comprise about 1,000 acres of land which is substantially virgin forest, and upon which the defendant has commenced lumbering operations, under the terms of an agreement which has been, by the decision of Justice Borst, determined not to be within the power of the Commissioner to make.

Two judgments against the New York Central and Hudson River Railroad Company, one in Herkimer county and the other in Franklin county, were reversed in the Court of Appeals and new trial ordered. These actions were for damages to State lands, caused by fire alleged to have been set by the railroad company in 1908.

During the year 1914 the Conservation Bureau of the Attorney-General's office has disposed of one hundred and nine cases. Of these, sixty-five involved titles to lands in the Forest Preserve of the State of New York; eleven actions for trespass, and twenty-five actions for violations of the fish and game provisions of the statute have been prosecuted.

The Commission directed an investigation of the legal status of the occupants of state lands in Township 40, (Raquette Lake), Totten and Crossfield's Purchase. There are located in this township about seventy occupants who appear to have no title to the lands which they occupy. Surveys have been made, records completed and data obtained upon which proceedings may be brought to recover possession of these lands.

There have been disposed of by action since January 1, 1914, the following cases:

Trespass	11
Fish and game	25
Fire	6
Title	65
Vacate judgment	1
False arrest	1

Of the cases pending and commenced during the year 1914, there are still pending:

Trespass	9
Fish and game	10
False arrest	3
Vacate judgment	1
Waste	1
Title	21

Of the ninety-two orders on hand January 1, 1914 for prosecution for violation of the Conservation Law, action has been taken as follows:

Closed before commencing action	22
Action commenced:	
pending	25
closed	27
Orders held awaiting data, surveys, etc	18

On the one hundred and fifty-five orders to prosecute received since January 1, 1914, action has been taken as follows:

Action commenced 74

	Closed.	Pending.
Fish and game	9	5
Trespass	6	3
Title	39	8
Set aside conveyance	...	1
Fire	1	...
Partition	...	1
Public Service rule violation	...	1
	55	19

Orders closed before action was started 6

Orders held awaiting data, etc.:

Fish and game	2
Trespass	4
Title	59
Fire	1
Recovered moneys	1
Set aside conveyance	1
Execute judgment	1
Public Service Rule violation	4
Top-lopping	1
Recovery of rents and taxes on oyster bed leases	1

Moneys Recovered Through Actions Brought by the Conservation Bureau, Attorney-General's Office

1914.		F. & G.	Trespass.	Fire.
Jan.	Maurice E. Rogalin	$20 00		
Feb.	George M. Hallock	12 50		
	George A. Owen	15 00		
	Wm. McLaughlin	10 00		
	Charles H. Cooper	12 50		
	J. B. Lunney	15 00		
March.	S. Guggenheim	85 00		
	Ai. W. Shaw		$10 00	
April	Truman Rice (judg.)	25 00		
May.	H. Duncan Wood	25 00		
	Visher Whipple	50 00		
June.	N. Y. C. R. R. Co. (costs)			$10 00
	Albert Premo			10 00
July.	Purity Blue Point O. Co.	72 00		
	Azel F. Merrill	1,276 00		
	Merrill & Bayles	49 20		
	John J. Ferry	36 15		
	Glenwood Oyster Co.	51 15		
	Cleveland DuBois		125 00	
Aug.	Philip V. Monk		100 00	
Sept.	Andrew Sullivan		50 00	
	Edgar Call (costs)	35 00		
	Wm. F. Cochrane	73 00		
Oct.	Charles Goetz (exec.)	117 11		
	Albert Frasier	51 00		
	George Eddy	15 00		
	Joseph Hilderbrandt	20 00		
	Frank Sherman		84 97	
	Norman Arnold			50 00
	Erie R. R. Co.			1,566 67
	N. Y. Telephone Co.		10 00	
	Joseph Burns	115 00		
	Myron Daley (exec.)		13 18	
Nov.	Bert Wright	20 00		
	Archie Bryden			15 00
Dec.	Long Island R. R. Co. (judg.)			586 16
	John P. Brannen (judg.)		25 00	

FINANCIAL STATEMENT OF CONSERVATION COMMISSION

SUMMARY OF RECEIPTS AND DISBURSEMENTS, EXCLUSIVE OF REGULAR ACCOUNTS WITH THE STATE COMPTROLLER, FOR FISCAL YEAR ENDING SEPTEMBER 30, 1914.

Total collections		$381,116 86
Fines and penalties	$67,740 39	
Net license	14,964 46	
Breeders' license	525 00	
Hunting license	208,250 00	
Possession of game license	485 25	
Tax and rental on shellfish lands	33,231 95	
Importation, foreign game	6,577 60	
Tagging trout	7,156 00	
Shipping into State license	20 00	
Cuba Reservoir rental	2,141 20	
Trespass on State lands	5,350 99	
Sale of trees	7,988 54	
Fire rebate	24,816 92	
Telephone rentals	106 40	
Refund on payrolls	54 16	
Fire fines	529 70	
Miscellaneous	1,178 30	
		$381,116 86

DISBURSEMENTS

By cash to State Treasurer	$380,407 26	
By refunds and cost of collection	709 60	
		$381,116 86

SUMMARY OF EXPENDITURES FOR FISCAL YEAR ENDING SEPTEMBER 30, 1914, BY DIVISIONS

General Office

Advertising and printing, in connection with public hearings	288 97	
Office expenses	22,883 57	
Traveling expenses	7,684 84	
Bureau of publication, expenses	981 75	
Official salaries	75,622 07	
Graded salaries	20,455 80	
Additional and temporary employees	3,070 00	
		$130,987 00

Division of Fish and Game

Expenses, steamboats and launches	$1,269 64	
Fines and penalties, court, attorney and witness costs	10,694 88	

Protectors and Division Chiefs' expenses	$59,458 18	
Protectors' expenses, special	5,328 58	
Fish and Game official salaries	5,400 00	
Fish and Game graded employees	123,966 12	
Superintendent of inland fisheries, salary	2,500 00	
Marine Bureau, expenses	5,000 00	
Surveying shellfish lands	482 16	
Marine Bureau:		
official salaries	11,807 26	
graded employees	1,034 48	
Fish hatcheries:		
maintenance	47,765 48	
repairs	2,347 83	
Collecting fish eggs	315 41	
Fish hatcheries:		
official salaries	4,000 00	
graded employees	9,180 00	
Fish hatchery, Warren county, examination of title	111 16	
Fish hatchery, St. Lawrence county, purchase and construction	2,036 26	
Game bird farm:		
maintenance	5,754 02	
official salaries	1,500 00	
Hunters' License Bureau:		
expenses	3,895 94	
printing licenses	1,500 00	
county clerks' fees	4,014 32	
graded employees	1,500 00	
Tagging machines and tags, purchase of	1,091 21	
Printing game laws	839 68	
		$312,792 61

Division of Lands and Forests

Forest Preserve, land purchase and expenses	$7,780 00	
Purchase of land	3,419 75	
Protecting State's title to lands (surveying)	4,037 09	
Lands and Forests, expenses of forestry bureau	5,354 64	
Reforesting	19,973 46	
Fire patrol	93,699 36	
St. Lawrence Reservation:		
maintenance	155 22	
lands and docks, purchase	1,500 00	
Cuba reservoir, surveying and caretaking	1,346 68	
Lands and Forests:		
official salaries	11,408 32	
graded employees	26,417 29	
		175,091 81

Division of Inland Waters

Hydrographic investigations	$9,467 67	
Surveys, investigations and river improvement	19,179 87	

Investigating river structures, dams, etc. (Section 22)	$2,311 73	
State dam, fourth lake, repairs	1,644 76	
Division of Inland Waters:		
official salaries	9,000 00	
graded employees	15,798 78	
Gate tenders' salaries, Old Forge and Beaver river	1,100 00	
		$58,502 81
		$677,374 23
Deduct amounts paid from Chapter 833, Laws of 1913, covering accounts incurred prior to October 1, 1913		36,994 20
Actual expenditures for fiscal year ended Sept. 30, 1914		$640,380 03

FOURTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

DIVISION OF INLAND WATERS

FOURTH ANNUAL REPORT

OF THE

CONSERVATION COMMISSION

DIVISION OF INLAND WATERS

To the Conservation Commission:

Herewith I transmit to you, pursuant to law, the annual report of the Division of Inland Waters for the fiscal year ending September 30, 1914.

Respectfully yours
JAMES J. FOX
Deputy Commissioner.

December 31, 1914

REPORT OF THE DIVISION OF INLAND WATERS FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1914

Divisions of Report.— In accordance with the Conservation Law, the work of the Division of Inland Waters is divided into the following parts:

I. Water Storage.
II. Hydraulic Development.
III. River Improvement.
IV. Drainage.
V. Water Supply and Sewerage.
VI. Inspection and Supervision of Hydraulic Structures.

The close relation and interdependence of heads I and II make it desirable to treat them together in the report.

Following the custom of previous years, the general summary of the work of the Division of Inland Waters given in the brief report to the Legislature required by law, is reprinted in the foregoing pages. This enables the reader to obtain in a short space a general view of the work. Those desiring to pursue the subjects into details can do so by referring to this more extended report, and there examine the data upon which the brief report rests.

I. WATER STORAGE, and
II. HYDRAULIC DEVELOPMENT

For those who have not followed the events of the past thirteen years relating to the subject we give below a short review of the acts of the State relating to water storage and power development by the State:

CHRONOLOGICAL TABLE

1902	Water Storage Commission.
1904	River Improvement Commission.
1905	State Water Supply Commission.

1906 Duties of River Improvement Commission transferred to State Water Supply Commission.
1907 Fuller Bill.
Grant to Long Sault Development Company.
1908–09 Investigations and Reports on Water Storage by State Water Supply Commission.
1910 River Improvement Applications.
1911 Conservation Law.
1912 General Plan of Conservation Commission for Utilization of Water Resources of State.
Passage of Bayne Bill by Senate.
Ferris Committee Report.
1913 Passage of Capital District Bill by Legislature.
Long Sault Charter declared unconstitutional by Attorney-General.
Repeal of Long Sault Charter.
Velte — Niagara Power Committee.
Second Report of Ferris Committee.

WATER STORAGE COMMISSION

As a result of the devastating floods of 1902, the Water Storage Commission consisting of five citizens of the State, together with the Superintendent of Public Works, the State Engineer and Surveyor, the Commissioner of Forest, Fish and Game, and the Attorney-General, was created. The Commission served without pay, and but $5,000 was appropriated for its expenses. It reported that the streams of the State should be regulated by water storage to be undertaken under State supervision and control by a permanent Commission, the costs to be assessed upon the beneficiaries.

RIVER IMPROVEMENT LAW

The recommendations of the Water Storage Commission were embodied in the River Improvement Law of 1904 and the administration of the law committed to a Commission composed of the State Engineer and Surveyor, the Attorney-General, the

Superintendent of Public Works, the Forest, Fish and Game Commissioner and one Commissioner — a civil engineer appointed by the Governor.

STATE WATER SUPPLY COMMISSION

The plan of appointing a Commission composed of officials whose attention was fully occupied with the duties of their principal offices was not successful, and the following year (1905) the State Water Supply Commission was created and in 1906 it was charged with the duties of the River Improvement Commission.

THE FULLER BILL

The greatest step toward a proper understanding of the hydraulic power situation in New York State, up to that time, was taken in the passage of the "Fuller Bill"— Chapter 569, Laws of 1907 — the title of which was "An Act Authorizing and Directing the State Water Supply Commission to Devise Plans for the Progressive Development of the Water Powers of the State for the Public Use Under State Ownership and Control, and Making an appropriation Therefor."

EXPENDITURES FOR WATER STORAGE AND POWER SURVEYS AND INVESTIGATIONS UNDER WATER SUPPLY COMMISSION

The appropriations for expenditure for surveys and investigations under the River Improvement Law and the Fuller Act from 1907 to 1910 were:

TABLE I

Expenditures for Storage and Power Investigations, State Water Supply Commission

	1907	1908	1909	1910
River Improvement	$15,000	$25,000	$15,000	$20,000
Fuller Act	35,000	75,000	30,000	50,000
	$50,000	$100,000	$45,000	$70,000

Total = $265,000.

These expenditures do not include salaries of Commissioners, secretary, etc.

These expenditures resulted in a thorough general investigation of the water powers of the State with special reference to water storage, and in nearly complete detail studies of the proposed Sacandaga and Schroon reservoirs on the Hudson and the Portage reservoir on the Genesee. Investigations of several other projects were brought to an advanced stage.

The final conclusion of the State Water Supply Commission as given in their sixth annual report (page 47) was "that the public interest plainly requires State control of water power developments and a system of management which will enable the State to derive a revenue from the sale or lease of the additional water power made available by such developments, and with opportunity for a revision at suitable intervals of the terms of such sale or lease." A bill was drafted designed to carry out the recommendations of the Commission.

LONG SAULT

Another important event of 1907 was the granting of a charter to the Long Sault Development Co. This charter provided for a small revenue to the State. The grant of this great power in the St. Lawrence river created much discussion, and during the passage of the bill it was so amended that the revenue to the State would have been problematical and very small. The passage of this bill was hailed as establishing the principle that the State would part with no more of its water powers without compensation.

From 1907 to 1913 inclusive, the company diligently prosecuted its endeavor to obtain the necessary consent of Congress and the Dominion of Canada, but did not succeed in either case. In 1913 the Attorney-General rendered an opinion that the charter was unconstitutional and the Legislature repealed the act. At the same time the company tendered the $25,000 payment required by its charter to the Treasurer of the State, and the tender having been refused on the ground of the unconstitutionality of the act a writ of mandamus was obtained by the company to compel acceptance. This action was followed to the Supreme Court and the company was defeated in all the courts. The Supreme Court decided that the incorporating act exceeded the powers of the Legislature and was unconstitutional.

PETITIONS UNDER RIVER IMPROVEMENT ACT

Several petitions were filed at different times under the River Improvement law, and in three cases the procedure before the Commission was carried to completion. These were: The Canaseraga creek improvement, in which case the petition was approved by the Commission, the decision was approved by the Legislature, and the work is nearing completion; the petition for the Hudson river improvement which was approved by the Commission subject to some important conditions relating to ownership of land by the state, and reservation of the power at the dam for the use and benefit of the State, but was not approved by the Legislature; and the petition for the improvement of the Genesee, disapproved by the Commission.

THE CONSERVATION LAW •

The Conservation Law was passed in 1911 and this Commission took office in July of that year. Under this Commission the investigations of the water resources of the State have been continued. The Commission has gone deeply into the legal and economic aspects of water storage and water power production and has formulated a public policy with respect to those resources designed to cover all aspects and phases of the matter and to conserve these resources for the use and benefit of all of the people of the State.

THE BAYNE BILL AND THE CAPITAL DISTRICT BILL

This general policy was embodied in a bill introduced in the Legislature of 1912 by Senator Bayne. This bill passed the Senate. Another bill applying the principles of the Bayne Bill to a specific case (The Capital District) was prepared by the Commission and introduced into the Legislature of 1913 by Senator Murtaugh. This bill passed both branches of the Legislature, but was vetoed by the Governor.

COMMITTEES OF THE LEGISLATURE.

The Ferris Committee of 1912 reported in regard to Water Storage, after an extended investigation.

1. That so far as the State owns water or water rights, the same should be conserved and developed to the maximum point of commercial efficiency, and that so far as such rights are owned by individuals, every encouragement should be given for their development.

2. That no further grants of water power privileges or rights to water, the ownership of which is clearly in the State, should be granted except for limited periods and upon provision being made for adequate compensation to the State.

3. That where grants have been made by the State of valuable water rights which, by their terms, are revocable, such grants should be revoked, in order that the State may enjoy the maximum benefit from its property, but that where the grants of the State have been made absolute and without any provision for their revocation, such rights should be regarded as sacred and inviolable.

4. That the various watersheds of the State should be improved, and that at the headwaters reservoirs should be constructed, where commercially practicable, for the impounding of storm waters, so that the flow of rivers may be regulated.

5. That in the enactment of any laws relating to the construction of storage reservoirs for the conservation of water the following principles should be observed:

   (a) The State, as such, should derive a revenue from such undertaking, thereby lessening the burden of general taxation.

   (b) All reservoirs for the impounding of water should be constructed under State supervision and control and according to plans and specifications prepared by the Conservation Commission.

   (c) Whenever reservoirs are constructed for the impounding of waters, they should be of a capacity ample to regulate properly the flow of streams so as to produce as near a uniform flow throughout the year as possible, and the ownership of such flood waters necessary for such regulation should be in the State.

(d) No improvement of a watershed should be undertaken or property acquired therefor until there have been deposited with the Conservation Commission either the funds necessary for such purpose, together with contracts requiring the payment of some profit to the State, by parties to be benefited, or contracts providing for the use of the water so impounded and the payment to the State by the beneficiaries of a sum at least sufficient in amount to pay interest, maintenance, and amortization charges, together with some profit to the State.

(e) All contracts for the use of the waters so impounded should provide for the release by the users of all title to so much of the flood waters as is necessary for the proper regulation of the stream flow.

(f) All contracts for the use of water should be made for a term of not to exceed fifty years, and should be subject to the paramount necessities of navigation and the rights of municipalities to acquire such waters for the uses of their inhabitants.

The Committee presented bills which they claimed would put into effect their recommendations. The bills contemplated turning over all of the water power and water storage on any watershed affected to a corporation upon terms to be determined by the Conservation Commission.

The Ferris Committee was continued by the 1912 legislature and in 1913 presented a report of its investigations of the work of the Ontario Hydro-Electric Power Commission. There was a majority and a minority report.

The majority reported that the operations of the Commission were a dismal financial failure, while the minority report stated that the whole project was a dazzling success. The committee reintroduced its bills in 1913. They failed of passage.

THE VELTE COMMITTEE

The Senate of 1913 appointed a committee to investigate and report upon the diversion of water from the Niagara river, and things incidental to the water power development on the river. This committee recommended in its report to the 1914 Legislature:

"Your committee feels that a State-wide hydro-electric development by the State itself would be a long step forward in the march of events hydro-electrical and would best satisfy the demands and fit the needs of the people of the Empire State, and from diligent and painstaking inquiry and delving into the question from an engineering, legal and practical business viewpoint, there would appear to be no meritorious grounds for objection to this plan. It, of course, realizes that there are in the State those who, for reasons of personal gain, and others, who have not yet learned of the advantages which will accrue to them under a State-fostered hydro-electric development, are not in accord with the conclusions of this committee, but it feels that the great mass of the people have come to the realization that the State's greatest means for cheaper heat, light and power lies in the development of its water resources by the State itself. In view of the fact that it believes the feelings of the people have been crystalized into a desire that the State undertake water power development, your committee submits that it is to no avail for it to consider any new plans or schemes which are being urged by private interests. The people of the State have long enough endured in enforced silence the excesses of private power companies, and will welcome the passage of a bill which is assured of the signature of the Governor, which contemplates State-wide development by the State itself of a tremendous waste energy; which empowers the Conservation Commission to acquire land and water privileges and water rights, to construct transmission lines for the purpose of delivering electrical energy to various municipalities throughout the State (these municipalities being authorized to enter into contract with the Commission for the use of power so transmitted, the maximum cost to the ultimate consumer being fixed by the Conservation Commission), and further provides that each municipality pay its proportionate share of the cost of production, and transmission, including a charge for interest, upkeep, maintenance and operation, with an amount sufficient to amortize the investment in from thirty to fifty years, and no municipality

> to pay taxes on anything but its actual municipal uses of light and power. Such a bill is Senate bill No. 248, introduced by the chairman of this committee and which is a duplicate of the Bayne bill, which received the approval of the Senate in 1912. Besides recommending the passage of this bill which will be a first step in the progress of State-wide hydro-electrical development by the State itself, and under the provisions of which the waters of the Niagara river will be developed by the State for the benefit of all the people. * * *"

This Committee found the Ontario Hydro-Electric Power Commission "has been successful." A minority report also found the results of the operations of that commission to be reduced prices to the consumer of electric current.

TABLE II

GENERAL DATA REGARDING PROPOSED STORAGE RESERVOIRS IN NEW YORK STATE.

WATERSHED	River	Reservoir	Capacity bil., cu. ft.	AVAILABLE HEAD BELOW RESERVOIR			State land required, acres	Private land required, acres	Total land required, acres	Value of real estate required	Cost of dams, bridges, etc.	Total cost of reservoir	Cost per million cu. ft.	COST PER MILLION CU. FT. PER FT. OF AVAILABLE HEAD BELOW RESERVOIR		Amount of power from plant connected to dam, 60% H. P.
				Developed	Undeveloped	Total								Developed	Total	
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVIII
Hudson	Hudson	Indian River‡	7.0	417	1,062	1,479	4,420	1,250	5,670	$25,000	$1,680,000	$1,705,000	$244	$0 58	$0 23	14,100
Hudson	Sacandaga	Sacandaga	28.8	398	305	703	35	29,365	29,400	2,000,000	2,661,000	4,661,000	162	0.41	0.23	41,100
Genesee	Genesee	Portage	†19.0	165	583	848	....	10,300	10,300	1,204,000	3,384,000	4,588,000	242	0.92	0.29	36,800
Black	Black	Hawkinsville	5.2	543	48	591	56	3,720	3,776	131,000	2,210,700	2,830,000	545	1.00	0.92	2,260
Black	Moose	Higley Mtn.	5.0	690	423	1,113	3,590	1,690	5,280	34,000	1,052,300	1,340,000	268	0.39	0.24	1,885
Raquette	Raquette	Oxbow	11.4	370	§873	§1,243	5,025	4,015	9,140	132,000	1,268,000	§2,000,000	175	0.47	0.14	....
Delaware	Delaware	Cannonsville	7.0	10	339	349	....	3,560	3,560	450,000	1,369,000	1,879,000	260	26.00	0.75	4,200
Delaware	Delaware	Cochecton	0.9	....	189	189	....	1,900	1,900	318,000	2,200,000	1,882,000	¶.......	....	....	8,250
Oswegatchie	Oswegatchie	*Cranberry l'ke	0.5	476	572	1,048	....	....	....	....	79,000	79,000	158	0.33	0.15	....
Oswegatchie	Oswegatchie	Newton Falls	3.0	476	572	1,048	....	3,800	3,800	23,000	623,000	743,000	248	0.52	0.24	....
Oswegatchie	Oswegatchie	Harrisville	5.0	311	212	523	....	4,250	4,250	131,000	474,000	696,000	139	0.45	0.27	....
Champlain	Saranac	L. Saranac l'ke	4.0	485	632	1,117	5,000	1,300	6,300	192,000	502,000	614,000	154	0.32	0.14	....
Champlain	Ausable	Cherry Patch pond	2.0	280	980	1,260	275	1,225	1,500	20,000	150,000	207,000	104	0.37	0.08	8,100

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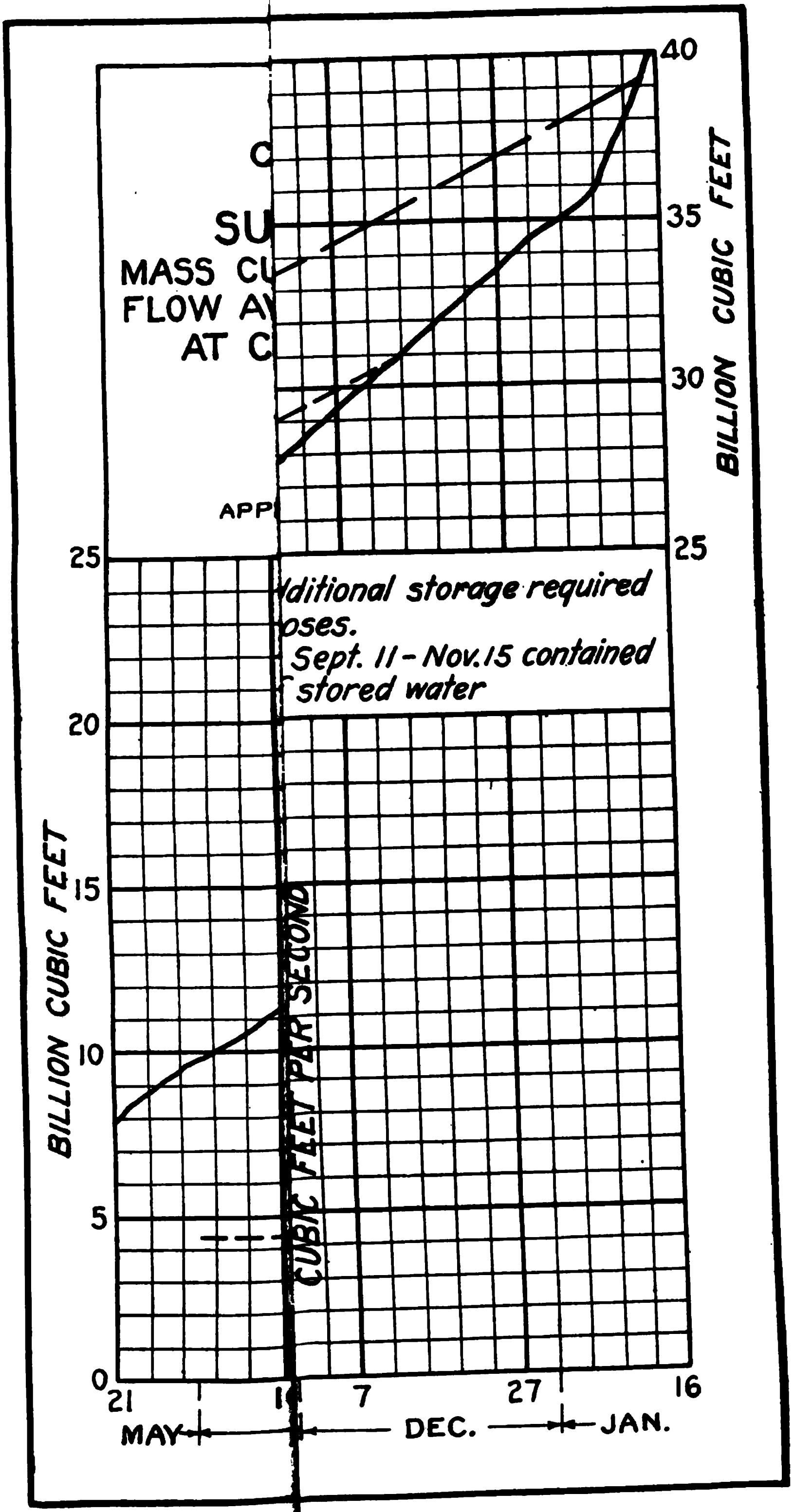
* Present capacity of Cranberry lake reservoir is about 2.5 b.c.f.; proposed capacity, 3.0 b.c.f.; increase, 0.5 b.c.f.

† 13.4 b.c.f. for power; 5.6 b.c.f. for flood protection.

‡ Present capacity, 4.6 b.c.f.; proposed capacity, 11.6 b.c.f.; increase, 7.0 b.c.f.

§ Provisional.

¶ Power project.


C
SU
MASS CU
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APP
ditional storage required
oses.
Sept. 11 - Nov. 15 contained
stored water
BILLION CUBIC FEET
BILLION CUBIC FEET
CUBIC FEET PER SECOND
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25
30
35
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21
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7
27
16
MAY
DEC.
JAN.

POWER AT CRESCENT AND VISCHER FERRY

In our Third Annual Report (1913) we published a complete analysis of the water supply to the Rome summit level of the Barge canal and computed its effect upon the project for developing power at Crescent and Vischer Ferry. The stream flow at these points was carefully analyzed for critically dry years. The results showed that in 1908 it would have been necessary to use only 0.62 billion cubic feet of stored water from Delta and Hinckley reservoirs to supply the needs of the canal; and an additional 1.16 billion cubic feet would have been necessary from storage to keep the flow at Crescent and Vischer Ferry up to a point where 6,000 (yearly peak) h. p. could be developed without interference with the operation of the canal.

In 1913 there would have been required 1.48 billion cubic feet additional from storage.

It was also shown that if the Hinckley reservoir is operated in the manner in which the designers of the canal proposed, more than sufficient water to operate the proposed plants would always be available at Crescent and Vischer Ferry, leaving Delta reservoir untouched and available for emergency uses.

Similar analyses of stream flow for 1914 show that the water required from storage to meet the requirements of the canal and the proposed Hydro-Electric plants at Crescent and Vischer Ferry are practically identical with the requirements for 1913. These results further confirm the previous claims of the Commission that its proposal to develop power from the waste water of the Mohawk river at the Crescent and Vischer Ferry dams of the Barge canal is entirely feasible without in any way interfering with the operations of the canal, but utilizing solely water that would otherwise flow wastefully over the dam; that the proposed capacity of the plants is ultra-conservative; and that the provisions for extensions made in the plans of the Commission will ultimately be utilized.

Plate I shows the analysis of the stream flow at Vischer Ferry for 1914.

THE POWER POSSIBILITIES OF THE SARANAC RIVER

Scope of Investigations

In accordance with the provisions of the Conservation Law which direct the systematic study of the water power resources of the State, a detailed investigation of the storage and power possibilities of the Saranac river was made during the field seasons of 1913 and 1914. The surveys included an accurate profile of the river from Lake Champlain, at Plattsburg, to Saranac Lake village, a survey of the proposed dam site near the foot of Lake Flower, and brief surveys of several undeveloped power sites. All existing power developments on the river were inspected, and data as to the wheel installation, head utilized and use of power were secured. Office investigations, made during the past winter, have included a critical study of all available streamflow and rainfall data, approximate estimates of streamflow at various points on the river, a detailed study of all promising storage basins, an estimate of the cost of the proposed Saranac Lake reservoir, and approximate estimates of the cost of developing some of the undeveloped powers. Thanks are due the local power users for their courteous co-operation, and the use of their files of maps, plans and other data. The field work was done under the supervision of Mr. F. D. Porter, assistant civil engineer, and the office studies were made by Mr. E. S. Cullings, assistant civil engineer.

The Saranac Watershed

The Saranac River has its headwaters in southern Franklin County in the lakes and ponds surrounding Upper Saranac Lake. Draining the three Saranac lakes, it flows northeasterly about 60 miles, and empties into Lake Champlain at Plattsburg. The total area of the watershed is 613 square miles. The upper reaches are mountainous and densely wooded with second-growth timber. The average elevation of the headwaters is about 1,600 feet above sea level. Between Bloomingdale and Cadyville the descent of the river is precipitous and broken by numerous falls and rapids, having a total fall of nearly 1,000 feet in a distance of 40 miles. Below Cadyville the river flows through a rolling sandy plain, descending to Lake Champlain with an almost uniform grade of 26 feet per mile.

UNIV.

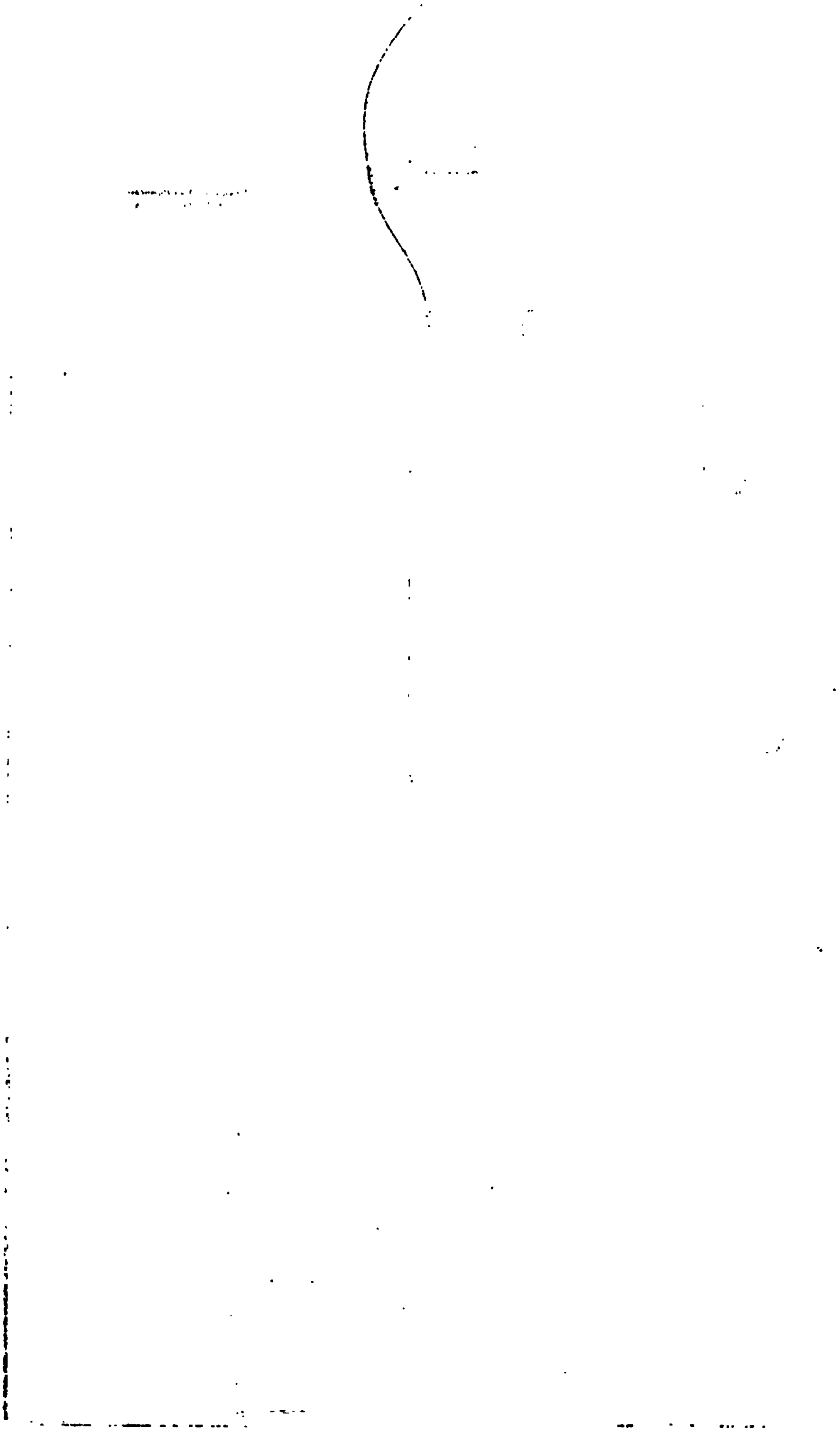


TABLE III

Drainage Areas, Saranac Watershed

	Square miles
Plattsburg (mouth of river)	613
Plattsburg (U. S. G. S. gaging station)	607
Cadyville	576
High Falls	495
Clayburg (below mouth of North Branch)	480
North Branch, at mouth	128
Tefft. Pond	347
Union Falls	330
Franklin Falls	293
Pyramid Rapids	280
Saranac Lake Village	185
Bartlett Carry	77

Hydrology

Lying on the easterly side of the Adirondack Plateau, the Saranac watershed receives a somewhat lower precipitation than those lying further to the west. The mean annual rainfall varies from 30 inches at Plattsburg to about 39 inches at Upper Saranac Lake, the average for the watershed being 35 inches. The mean annual temperature at Plattsburg is about 44°F., and at Upper Saranac Lake, about 39°, with a mean of 41° for the whole watershed. The prevailing wind is northwesterly. The annual run-off at Plattsburg during the past 11 years has varied from 12.3 inches (1907) to 20.7 inches (1905), with a mean of 16.4 inches. This amounts to 47 per cent. of the mean annual rainfall, or 1.21 second-feet per square mile of tributary drainage area. The maximum flood discharge recorded during the past 11 years amounted to 6400 second-feet, or 10.5 second-feet per square mile of drainage area.

Streamflow Data

In March 1903, a gaging station was established by the United States Geological Survey at the plant of the Plattsburg Light, Heat and Power Company, just above the city of Plattsburg. The records from this station have been maintained to the present date, and they are the only run-off data available on the Saranac river. Consequently, in the estimates of streamflow shown in

Table IV for all points above Plattsburg, it has been necessary to compute the discharge by means of a "conversion factor." This method is based on the formula:

$$Q_1 = \frac{A_1R_1}{A_2R_2} Q_2, \text{ in which}$$

$Q_1 =$ Discharge at the point under consideration.
$Q_2 =$ Known discharge at some other point.
$A_1 =$ Drainage area at the first point.
$A_2 =$ Drainage area at the second point.
$R_1 =$ Mean annual rainfall at the first point.
$R_2 =$ Mean annual rainfall at the second point.

The discharge may be estimated for daily, weekly or monthly periods, but the mean monthly discharge is most commonly used, and this has been used in the estimates following. The above formula is based on the assumption that the run-off at any two points on the same stream will be directly proportional to their respective drainage areas and the mean annual rainfall on each. While this may not be strictly true, the difference in rainfall on the various divisions of the Saranac watershed is not very great, and estimates of run-off so computed should be reasonably accurate.

Seven rain-gaging stations in or near the Saranac watershed have been maintained for periods ranging from 4 to 57 years. Lines of equal rainfall, as shown by these records, have been plotted on the watershed map, Plate II.

STORAGE RESERVOIRS

Saranac Lake Reservoir

Owing to the exteme fluctuation of the natural streamflow, artificial regulation is one of the prime necessities in the development of the Saranac River. This subject therefore has been given considerable study, and in course of the surveys of 1913, all promising storage basins were examined. There appears to be only one site where any large quantity of storage can be obtained for a reasonable expenditure. This reservoir site is an irregular-shaped swampy basin above the village of Sananac Lake, including within its

PLATE IV

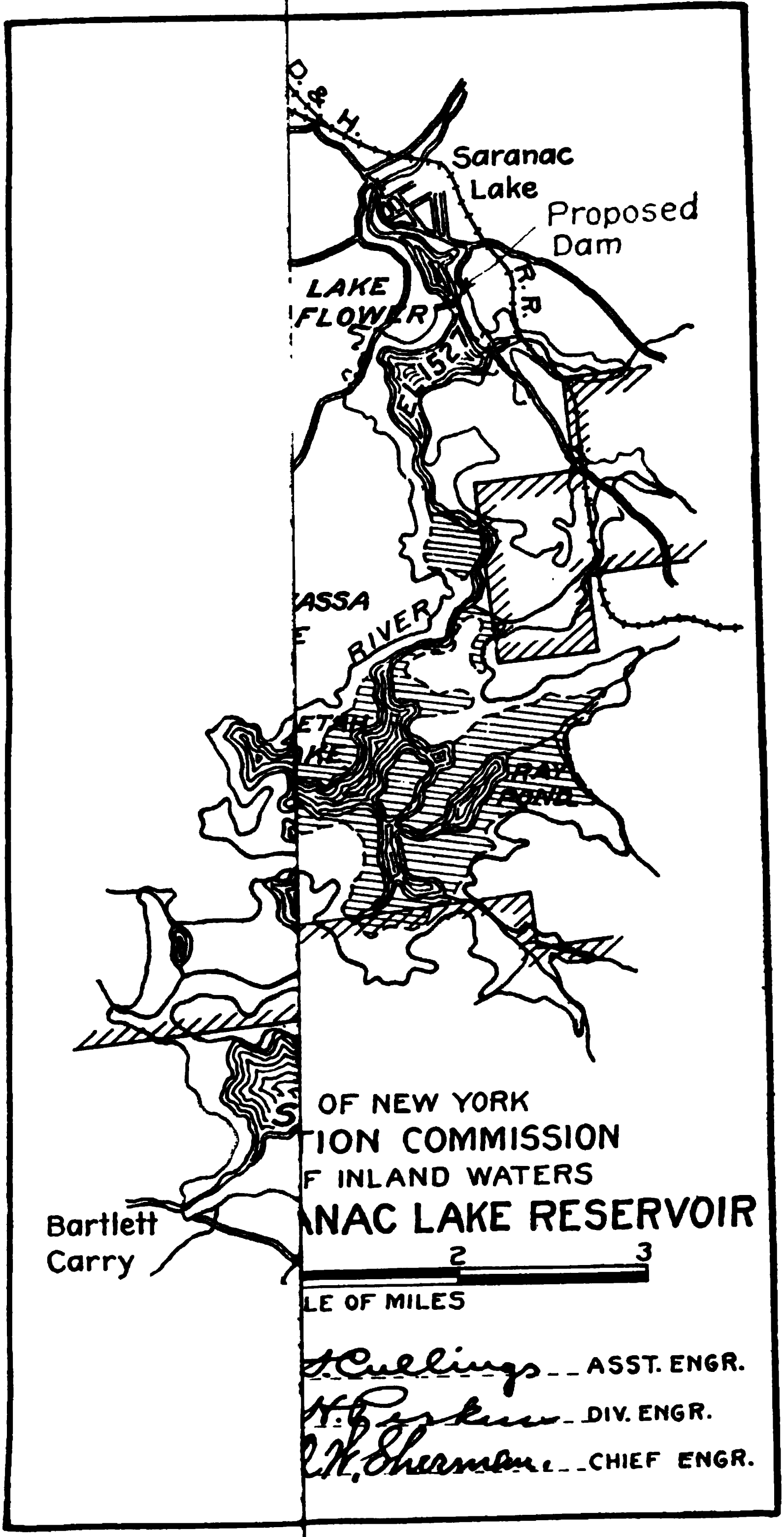

D.&H.
Saranac Lake
Proposed Dam
LAKE FLOWER
R.R.
1527
ASSA
RIVER
RAY POND
Bartlett Carry
OF NEW YORK
TION COMMISSION
F INLAND WATERS
NAC LAKE RESERVOIR
2
3
LE OF MILES
Cullings __ ASST. ENGR.
DIV. ENGR.
W. Sherman ___ CHIEF ENGR.

PLATE V

STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

AREA AND CAPACITY CURVES
PROPOSED SARANAC LAKE RESERVOIR

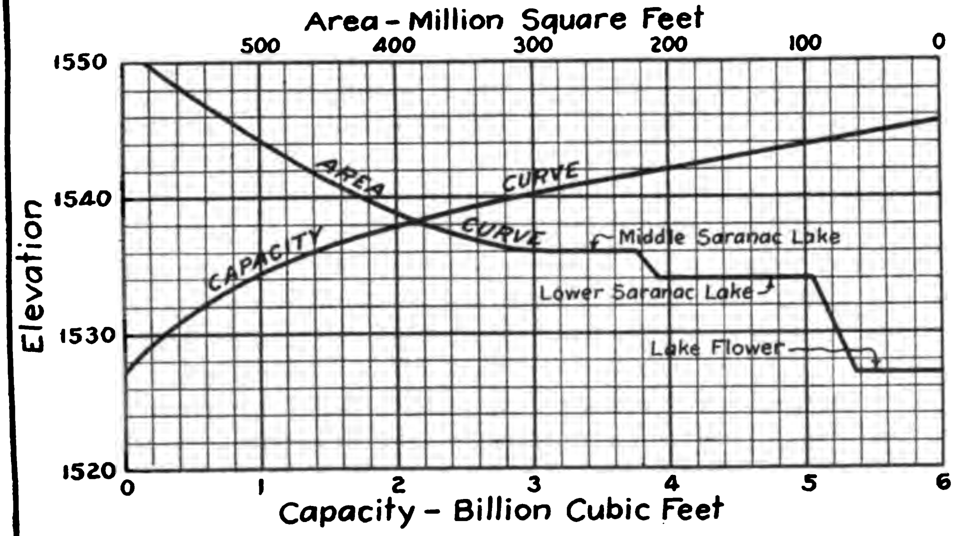
JANUARY 1915

E. H. Cullings ASST ENGR.

A. H. Perkins DIV. ENGR.

APPROVED R. W. Sherman CHIEF ENGR.

Proposed flow line, elevation 1544.
Maximum depletion, 10 feet.
Capacity, 4.0 billion cubic feet.



area Lake Flower, Oseetah Lake and surrounding swamp and flowed lands, Kiwassa Lake, Lower Saranac Lake, and Middle Saranac Lake and adjacent swamp lands.

At the outlet of Lake Flower a dam with spillway crest at elevation 1,544 feet above sea level, or 17 feet above the low-water surface of the lake would permanently flood all the swamp lands surrounding Lake Flower, Oseetah Lake and Ray Pond. It would raise the surface of Lower Saranac Lake by 10 feet, and middle Saranac Lake by 8 feet, submerging all surrounding swamp lands. With a draft of 10 feet, the proposed reservoir would have a capacity of 4.0 billion cubic feet, sufficient to completely regulate the tributary drainage area of 185 square miles, and yet leave at all times enough water in the reservoir to completely cover all the flowed lands surrounding Lake Flower and Oseetah Lake. During the entire navigation season there would be sufficient water for uninterrupted navigation (without the use of locks) from the regulating dam to Bartlett Carry.

Though, as yet, no borings have been made, the dam site appears to be a favorable one; both banks of the river are of firm compact glacial material, and the bed is of gravel and small stones. The indications are that ledge rock lies at no great distance below the bed of the stream. Owing to the fact that the rock surface has not been definitely located, a reinforced concrete dam with cut-off wall extending to rock has been considered in the following estimate of cost. If ledge rock is found to be near the surface, a solid masonry dam can be built at about the same cost.

Property damage will not be excessive. A total of only about thirty-five cottages will be affected, and in many cases these cottages can, at no great expense, be moved back to higher ground. Boat houses will have to be rebuilt, taking into account the fluctuation which will occur during the navigation season. The total area included within the proposed flow line is 11,500 acres, of which nearly half (5,500 acres) is natural water surface. Of the 6,000 acres of land to be submerged, all but about 1,300 acres is the property of the State. It will be necessary to relocate or reconstruct about two miles of the Delaware and Hudson railroad, and about 2.5 miles of highway.

The shores and all flowed land within the reservoir basin should be entirely cleared of standing timber, and all stumps and partially submerged "dead-heads," which now prove such a menace to navigation, should be removed.

The cost of the proposed reservoir is estimated as follows:

Land	$42,000
Clearing and grubbing	140,000
Relocating highway and bridges	30,000
Relocating railroad	40,000
Damage to cottages and boat houses	150,000
Dam and outlet works	132,000
Engineering and contingencies, 15 per cent.	80,000
Total	$614,000
Cost per million cubic feet	$153 50

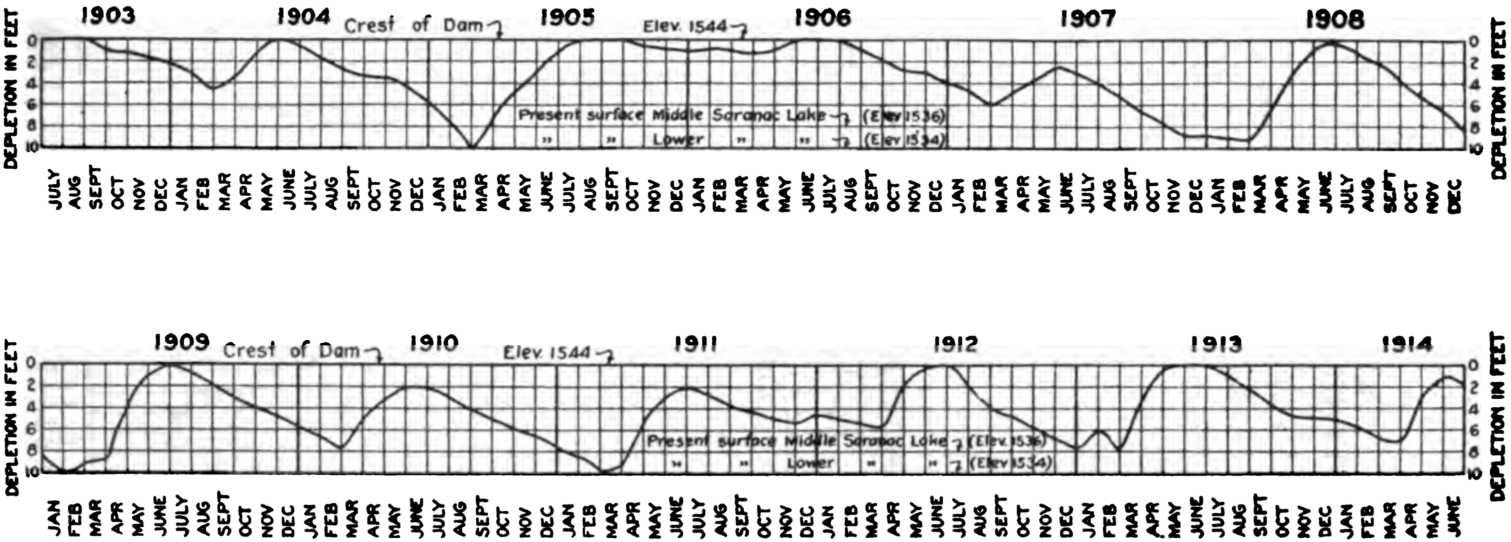
The creation of this reservoir is highly desirable for summer resort, health and pleasure purposes, as well as for power, but inasmuch as "business and pleasure" can here be so admirably combined, the needs of the water powers should probably receive first consideration, and the powers benefited should bear the greater part of the burden of financing the project. However, the value of all property in the vicinity of the reservoir will be materially enhanced, and therefore this property should bear its proportionate share of the construction and maintenance costs.

Upper Saranac Lake

At its outlet, Upper Saranac Lake has a drainage area of 77 square miles. Sufficient storage for the complete regulation of this area is easily obtainable, but inasmuch as complete regulation is provided for in the proposed reservoir above described, the upper reservoir will be unnecessary.

Bloomingdale Swamp

Between the villages of Saranac Lake and Bloomingdale, a distance of about six miles, the river flows through an extensive swamp having an area of not less than 2,200 acres, which might be flooded to a depth of from 20 to 25 feet by a dam at the head of Pyramid Rapids, a short distance below Bloomingdale. Additional storage to the



EXPLANATION:-
This curve shows the depletion in feet below the spillway crest, which would have occured, had the reservoir been in operation during the past 11 years

STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS
DEPLETION CURVE
PROPOSED SARANAC LAKE RESERVOIR

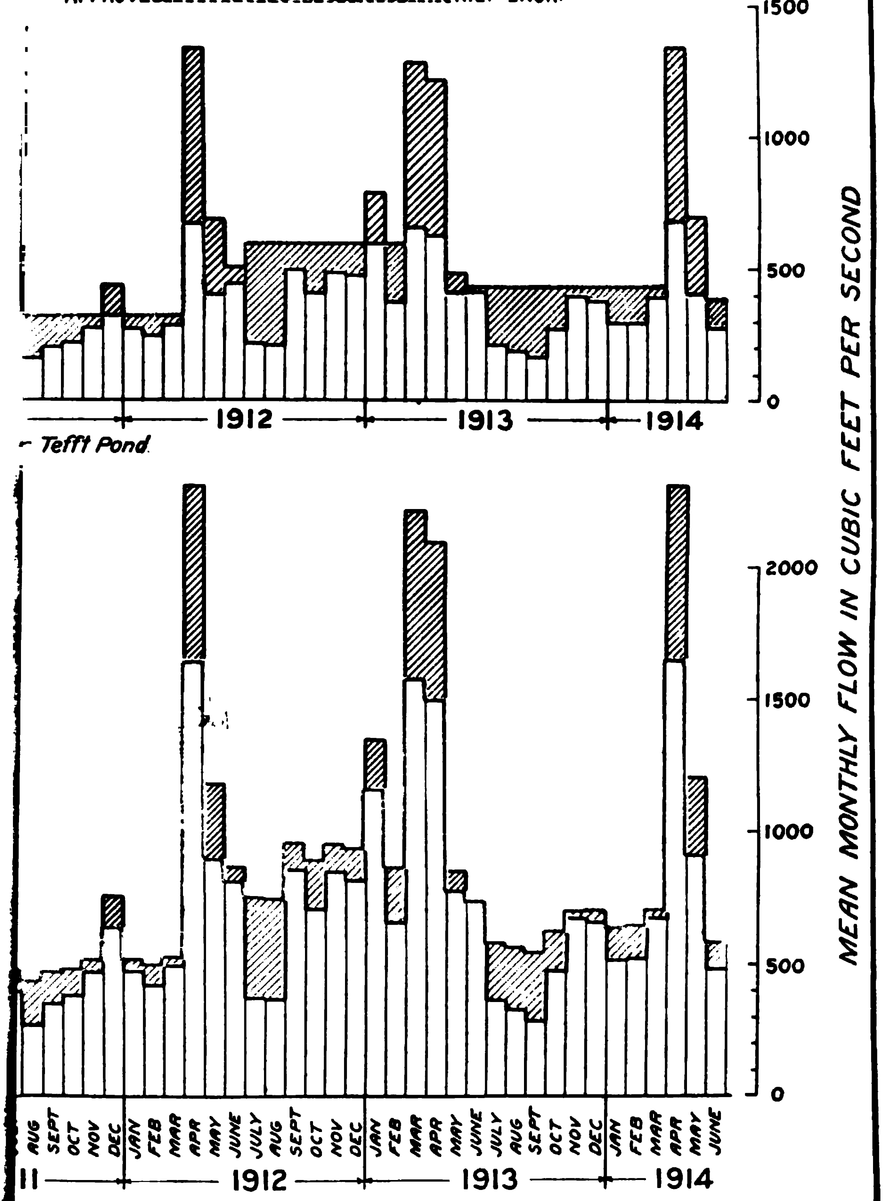
JANUARY 1915

E. S. Cullings ASST ENGR.
A. H. Perkins DIV. ENGR
APPROVED R. W. Sherman CHIEF ENGR.

STATE OF NEW YORK
ONSERVATION COMMISSION
DIVISION OF INLAND WATERS

RAPH SHOWING EFFECTS OF REGULATION ON SARANAC RIVER

E. H. Cullings ASST. ENGR
A. H. Perkins DIV. ENGR.
APPROVED R. W. Sherman CHIEF ENGR.



amount of about 2.0 billion cubic feet would be available, but the cost, from property damage alone, would be prohibitive. A large part of the business section of Saranac Lake village would be submerged, and about ten miles of new State road would have to be relocated. The project therefore is not considered feasible.

Franklin Falls A small amount of storage has already been obtained at this place. By increasing the height of the dam by 10 feet, a total storage of about 0.35 billion cubic feet can be obtained without seriously interfering with the operation of the power plant.

Union Falls About 0.50 billion cubic feet of storage is now available at this place. This amount can be doubled by increasing the height of the dam by 8 feet, but this increase would interfere somewhat with the operation of the Frankling Falls plant.

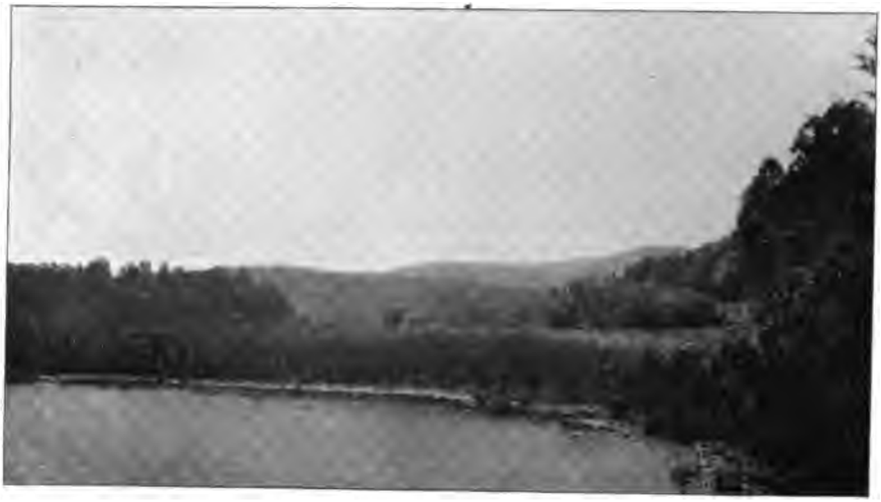
Tefft Pond The amount of storage here available does not exceed 0.10 billion cubic feet, an amount so small that it can hardly be considered other than as "pondage" for the proposed power development hereinafter described.

Lake Kushaqua The North Branch is almost entirely lacking in reservoir possibilities, though a small amount of storage has been privately developed at Lake Kushaqua. The storage capacity of the lake does not exceed 0.15 billion cubic feet, and it cannot be materially increased. This storage is at present used chiefly for log driving in the spring, and under ordinary conditions, the reservoir is maintained at spillway level during the summer months.

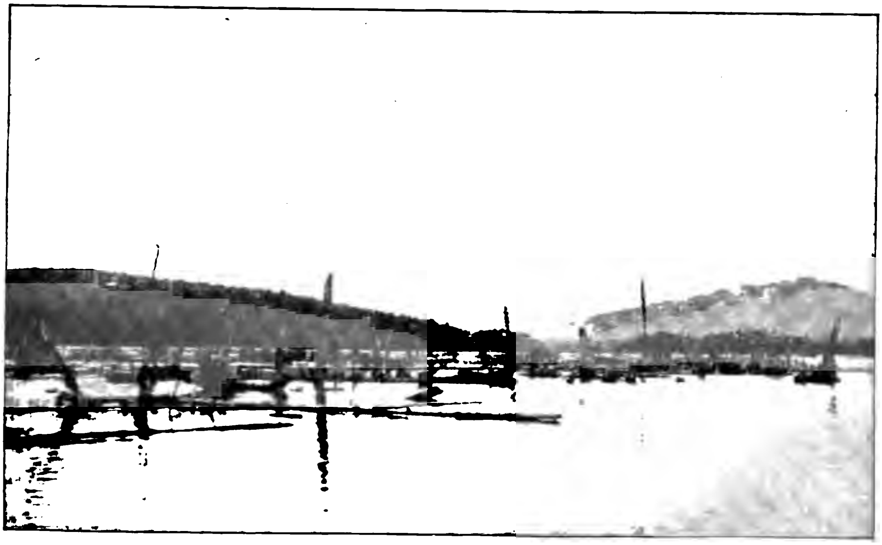
All of the small reservoirs above mentioned will be of some value in the regulation of the river, and collectively they can be so manipulated as to provide at least 1.0 billion cubic feet of storage. At present they are all under private control and they have not been considered in the estimates of streamflow and available power, shown in Table IV. This table shows the benefits which will result from the proposed Saranac Lake reservoir only. However, with these smaller reservoirs in use, even with present capacities, the total amount of power available will be somewhat higher than that shown in the table.

Method of Operating Reservoirs In the use of stored water through a number of plants at various distances from a storage reservoir, it is obvious that, due to the inflow of tributary streams below the reservoir equally good regulation cannot be secured at all points. Each reservoir must be so regulated as to provide, as nearly as possible, a uniform year-round flow at some definite point on the stream. Under ordinary conditions this point should be so selected that, within the economic wheel installations at the various plants, a maximum amount of energy will be added to the stream as a whole. If, however, this plan is strictly followed, it may be necessary at certain times, while the reservoir is filling, to completely close the outlet gates, and thus entirely, or very nearly, shut off all flow from a plant located at, or near, the reservoir. Such would be the case with the power and pumping plants at Saranac lake. It will therefore be necessary to determine a just and equitable minimum flow which should be maintained at this point while the reservoir is filling, even though some plants at points further down stream have more water than they can use. At Saranac Lake, the average monthly flow for the lowest month each year for the past 11 years has amounted to about 100 cubic feet per second, and in 1908 the mean flow for the month of September amounted to only about 50 cubic feet per second. Therefore, for the purposes of this study, it has been tentatively assumed that the interests of all will be best served if a minimum flow of 100 cubic feet per second be maintained at this point while the reservoir is filling. This has the effect of shifting the period of low flow from the summer to the spring months. The following estimates of regulated flow are based on this method of operation.

A careful study of the profile of the Saranac River, and of the power developments thereon, indicates that the proposed reservoir should be so operated as to give, as nearly as may be, an even flow at a point near the mouth of the North Branch. Therefore, in the following studies it has been assumed that the Saranac Lake reservoir will be operated for best results at the proposed Tefft Pond power development. On this basis, mass curves and the resulting "power-percentage-of-time" curves have been com-



Swampy Shore of Middle Saranac Lake



Flowed Land, Oseetah Lake

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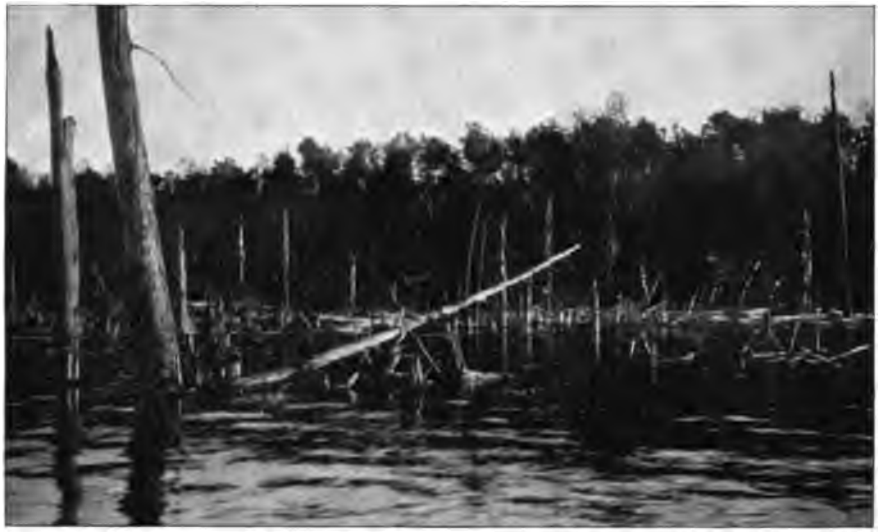
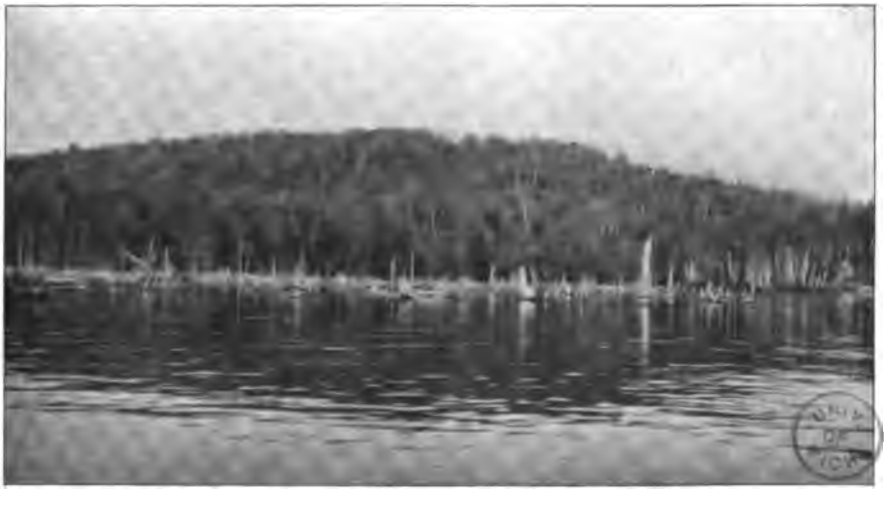


Present Shore Line, Oseetah Lake



Present Shore Line, Lake Flower

Proposed Dam Site — Saranac Lake Reservoir

Pyramid Rapids Power Site

puted and plotted, and from these curves, the resulting benefit at each of the existing plants, and at all undeveloped sites has been deduced.

POWER DEVELOPMENTS AND POSSIBILITIES

Basis of Comparison

The economic development of a water power usually requires a wheel capacity considerably in excess of that required for the minimum flow of the stream. Depending somewhat on the purpose for which the power is used, a turbine installation of sufficient capacity to utilize the whole flow of the stream for from six to eight months each year is usually economical; and if continuous year-round power is required, the deficiency during the low-water period is supplied by an auxiliary plant. For the purpose of reducing all plants and undeveloped power sites to a common basis of comparison in this discussion, a wheel installation which can run at full capacity 60 per cent. of the average year (7.2 months) has in each case been adopted as the economic development for either natural or regulated flow.

All estimates of streamflow are based on mean monthly discharges. These flows will, of course, be subject to certain daily or weekly variations caused by the manipulation of pondage at plants further up stream, but in most cases, particularly at the undeveloped power sites, sufficient pondage can be obtained to eliminate, to a great extent, the effects of such manipulation.

Owing to the impossibility of making, within the time allotted to this work, a thorough sub-surface investigation at each of the undeveloped power sites, we have been able to prepare only very rough estimates of the cost of developing these powers, but liberal assumptions have been made, and it is believed that these estimates are sufficiently accurate to form a fair basis of comparison of the relative merits of the various projects. Hydro-electric development has been assumed in each case, but the estimates for electrical apparatus do not include transformers or transmission lines. The cost of acquiring land and riparian rights is not included.

The following statements briefly summarize the principal physical conditions at each of the existing plants and at undeveloped power sites. The details of both present and proposed developments are shown in Table IV, following page 90.

Plattsburg First Dam In the vicinity of Plattsburg there are six dams creating an aggregate head of 128 feet. There is also one undeveloped site where a head of 21 feet can be obtained. The first of these dams is a crib structure about 12 feet high and 350 feet long. About half of the available flow under 15 feet of head is used by a paper mill, and most of the remainder, under 13 feet of head, is used by a pulp mill at the southerly end of the dam. Two small factories at the northerly end of the dam have rights to a part of the "surplus" water. There appears to be no physical reason why the whole flow should not be used through the maximum available head of 15 feet, and the entire power developed at a single plant. A considerable increase in power could thus be obtained.

Second Dam About one-half mile up stream is a timber crib dam having a height of about 9 feet and a length of about 190 feet. At the easterly end an electric power plant utilizes about 50 per cent. of the streamflow, while the remainder is divided between a grist-mill and a machine shop on the westerly bank. A slight increase in head might be obtained by the use of flashboards.

Third Dam This is a concrete structure located about two miles from the mouth of the river. A head of 22 feet is created and power is used in a paper mill on the southerly bank of the river.

Fourth Dam An electric power plant here utilizes a 14-foot head created by a concrete dam. The United States Geological Survey has for the past 11 years maintained a stream-gaging station at this place.

Fifth Dam A crib dam about 30 feet high and 550 feet long, with a 12-foot steel penstock about 400 feet long creates at this place a head of 42 feet. Power is used in a steel plant.

Sixth Dam At Treadwell Mills a concrete dam makes available a head of 27 feet, power from which is utilized in the operation of a pulp mill.

PLATE X

STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS
POWER-PERCENTAGE-OF-TIME CURVES

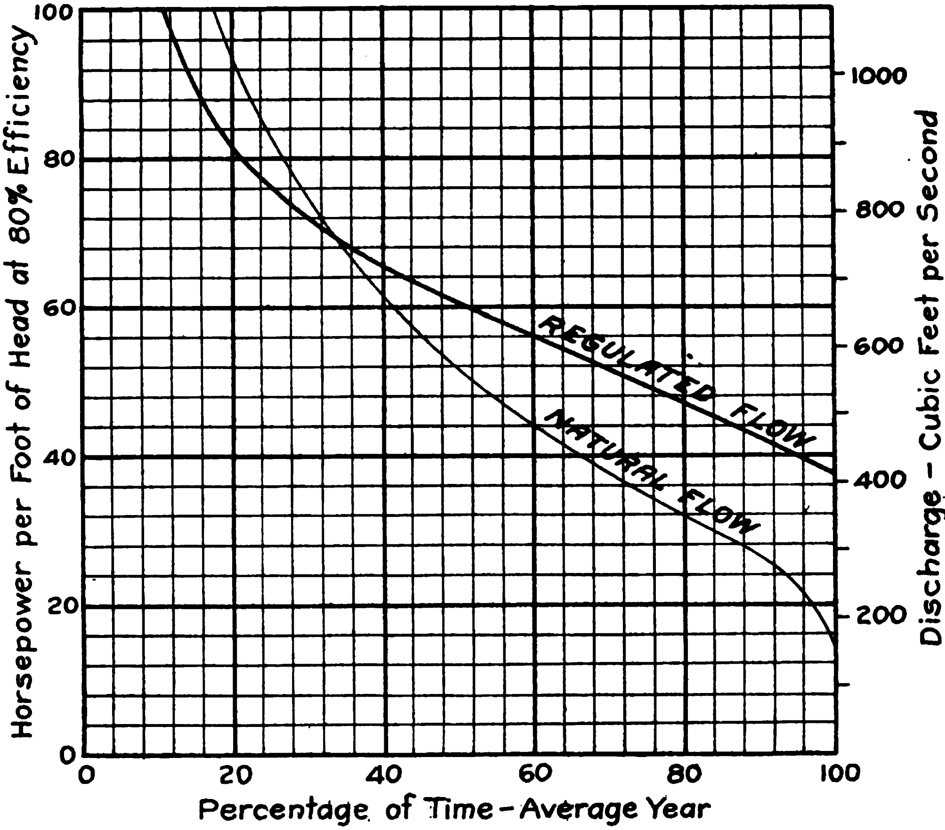
SARANAC RIVER AT PLATTSBURG

JANUARY 1915

ASST. ENGR.
DIV. ENGR.
APPROVED CHIEF ENGR.

NOTE:-

Regulated flow line shows resulting regulation from 4.0 billion cubic feet of storage in proposed Saranac Lake Reservoir.



Undeveloped Site Just above the highway bridge between the second and third dams above described, is a favorable opportunity for the development of a 21-foot head. At this point the bed of the river is of solid rock, and the banks are partly of rock and partly of firm impervious soil. A concrete dam not over 20 feet high above stream bed, and about 400 feet long, with a canal or head race carrying the water about 500 feet down stream to the power house site on the easterly bank of the river, would create a gross head of 23 feet. The average net working head is estimated at 21 feet. With the regulated flow due to 4.0 billion cubic feet of storage in the proposed Saranac Lake reservoir, there would be available at all times a flow of about 405 cubic feet per second, and for 60 per cent. of the average year, a flow of about 615 cubic feet per second. These flows, with the given head, would produce, at 80 per cent. efficiency, 773 and 1,175 horsepower, respectively. There are not sufficient physical data at hand for an accurate estimate of cost, but based on an installation of 1,200 horsepower, the construction cost should not exceed $100 per horsepower.

Morrisonville From the crest of the Treadwell Mills dam to the tailwater of the lower mill at Cadyville, a distance of about 6 miles, the river has an even grade of 23 feet per mile, the gross fall being 139 feet. The only power development in this section of the river is that at Morrisonville, where the streamflow is divided between a grist-mill on the southerly bank, using a 9-foot head, and a sawmill at the northerly end of the dam, utilizing about 7 feet of fall. At several points small heads, ranging from 10 to 12 feet might be developed, but owing to the great breadth of the river channel and the lack of suitable foundations, it is probable that under present conditions these powers would not be found economical.

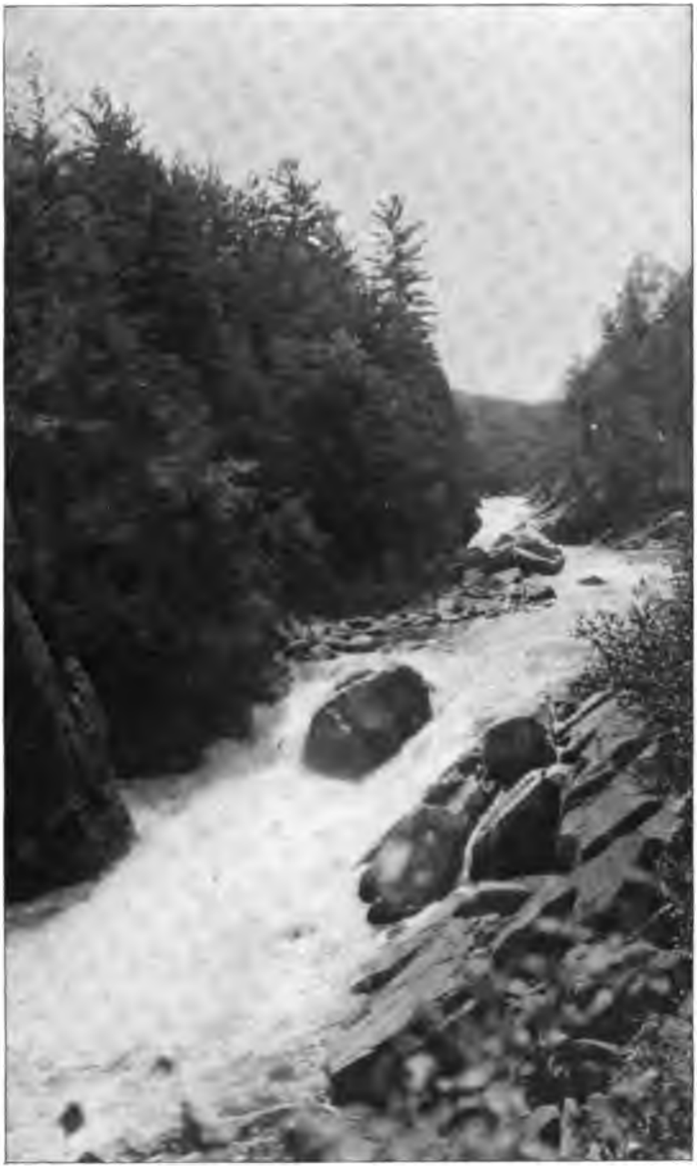
Cadyville Lower Mill A concrete dam of multiple-arch type here diverts water into a steel penstock through which it is conveyed to a pulp mill about 2,200 feet down stream from the dam. The gross head is about 159 feet. This is the largest power development on the Saranac river.

Upper Mill A rocky gorge at this point is closed by a masonry dam about 60 feet high, and less than 200 feet long. The gross head of 65 feet is completely developed. Power is used in a pulp mill near the northerly end of the dam.

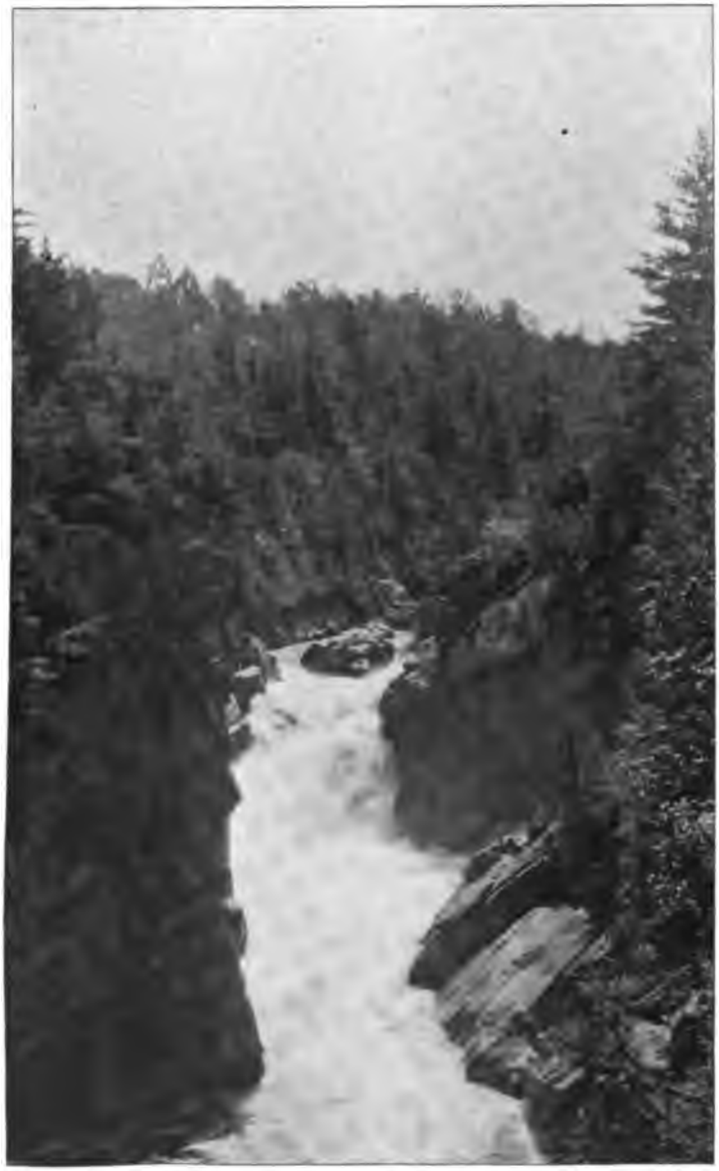
Undeveloped Head A third development has already been started at this place. The dam is located at a point about one-half mile above the Delaware and Hudson railroad bridge, where a narrow rock gorge from 40 to 50 feet deep, with vertical banks, affords an ideal site for the masonry dam, which is already in place. With a steel penstock, or other conduit carrying the water to the pool of the upper mill above noted, a total head of 78 feet will be available. With the proposed regulation, a continuous power output of about 2,700 horsepower can be maintained, and for 60 per cent. of the average year, about 4,000 horsepower will be available.

Saranac The next power devolopment is a grist-mill at the village of Saranac, where a head of about 8 feet is created by means of a crib dam. By deepening and enlarging the tailrace and using 12-inch flashboards during the low-water period, this head might be increased to 11 feet.

High Falls This gorge, with its precipitous descent of 200 feet within a distance of less than half a mile, offers a remarkable opportunity for power development. A narrow gorge at the head of a series of falls and rapids with its almost vertical banks of solid granite rock affords an economical site for a dam. In the suggested scheme for development, a steel conduit, barely 2,000 feet long, would carry the water to a surge tank on the top of the high bank on the westerly side of the river nearly opposite the foot of the falls. This tank in turn would be connected with the power house by smaller steel penstocks about 500 feet long. The power house site is about 200 feet below the foot of the falls. With a dam 60 feet high, or to elevation 1,035 (above sea level), a working head of not less than 242 feet can be made available. With the proposed regulation, a minimum flow of about 380 cubic feet per second can be maintained, and for 60 per cent. of the average year, about 520 cubic feet per second. These flows with the given head would produce 8,360 and 11,440 horsepower, respectively.



High Falls Power Site — Upper Falls



High Falls Power Site — Middle Falls

High Falls Power Site — Lower Falls

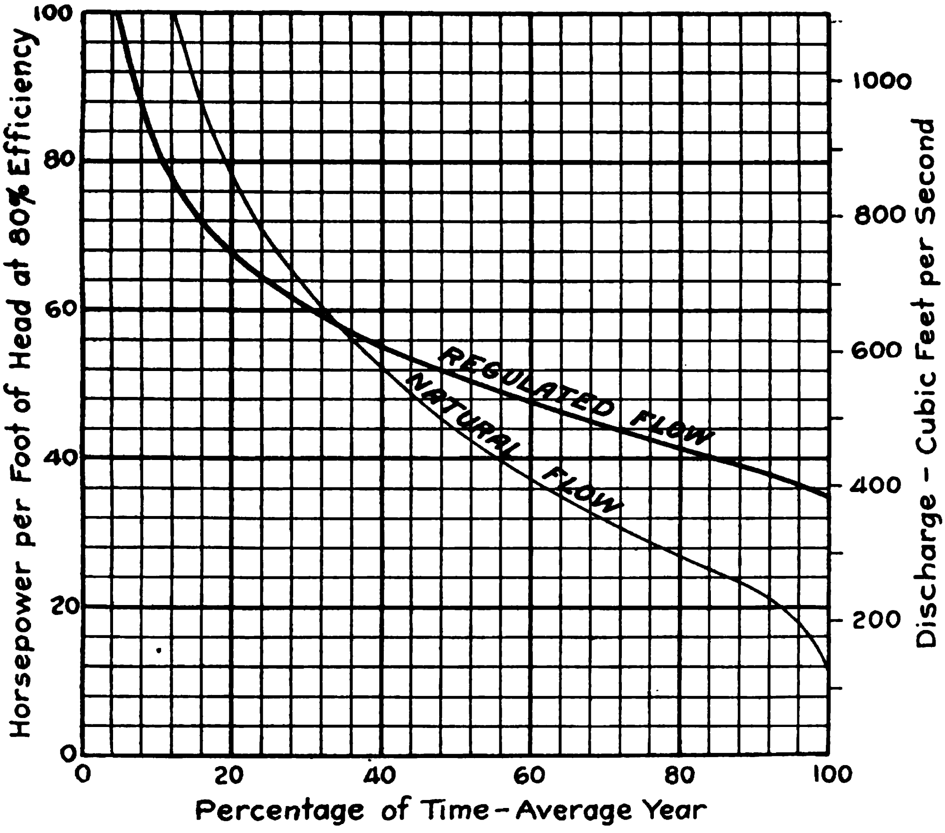
STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

POWER-PERCENTAGE-OF-TIME-CURVES
SARANAC RIVER AT HIGH FALLS

JANUARY 1915

E. S. Cullings ASST. ENGR.
A. H. Perkins DIV. ENGR.
APPROVED R. W. Sherman CHIEF ENGR.

NOTE:-
Regulated flow line shows resulting regulation from 4.0 billion cubic feet of storage in proposed Saranac Lake Reservoir.



The approximate cost of this development, as outlined above, and based on an installation of 12,000 horsepower, is estimated as follows:

Dam and headworks	$116,000
Ten-foot riveted steel conduit	61,300
Surge tank, penstocks, etc	44,000
Power house	32,000
Hydraulic and electrical machinery	120,000
Engineering and contingencies, 15 per cent.	56,700
Total	$430,000
Cost per horsepower, exclusive of land and riparian rights	$35.83

This development cost is extremely low; assuming so low a figure as $100 per horsepower as the amount which can be economically invested in a water power development, it is seen that this plant alone could bear the entire cost of the proposed Saranac Lake reservoir.

Redford At the site of an old blast furnace near the village of Redford, a working head of 36 feet is available. The proposed scheme of development includes a masonry dam at a point near the site of the former blast furnace dam, and a short canal leading to a point near the northerly end of the highway bridge. Short steel penstocks would connect with the power house, immediately below the highway. This plan would make necessary the relocation of about one mile of the highway between Redford and Clayburg, but other property damage would be trifling. Sufficient data for an estimate of cost of this project are not available, but with regulated flow and an installation of 1,700 horsepower, the cost should not exceed $100 per horsepower.

Tefft Pond Between the crest of the present dam at Tefft pond and the water surface at the mouth of the North Branch at Clayburg, there is a gross fall at 202 feet. There are, however, between these two points, few sites where dams can be economically located. Therefore, the most feasible scheme seems to be to raise the height of dam at Tefft pond by about 10 feet, providing additional pondage as well as head, and to convey the water under low head through a reinforced concrete or steel conduit about 14,000 feet long to the high bank on the north branch about one-half mile above the Clayburg bridge. This bank offers a practicable site for a surge tank, from which short penstocks would lead to the power house on the southerly bank of the North Branch. In this way a net working head of about 188 feet can be secured. With regulated flow, about 5,470 continuous 24-hour horsepower would be available, and for 60 per cent. of the average year, about 6,670 horsepower. The construction cost, based on an installation of 6,800 horsepower, is estimated at $638,000, or $93.80 per horsepower.

Shell Rock Rapids

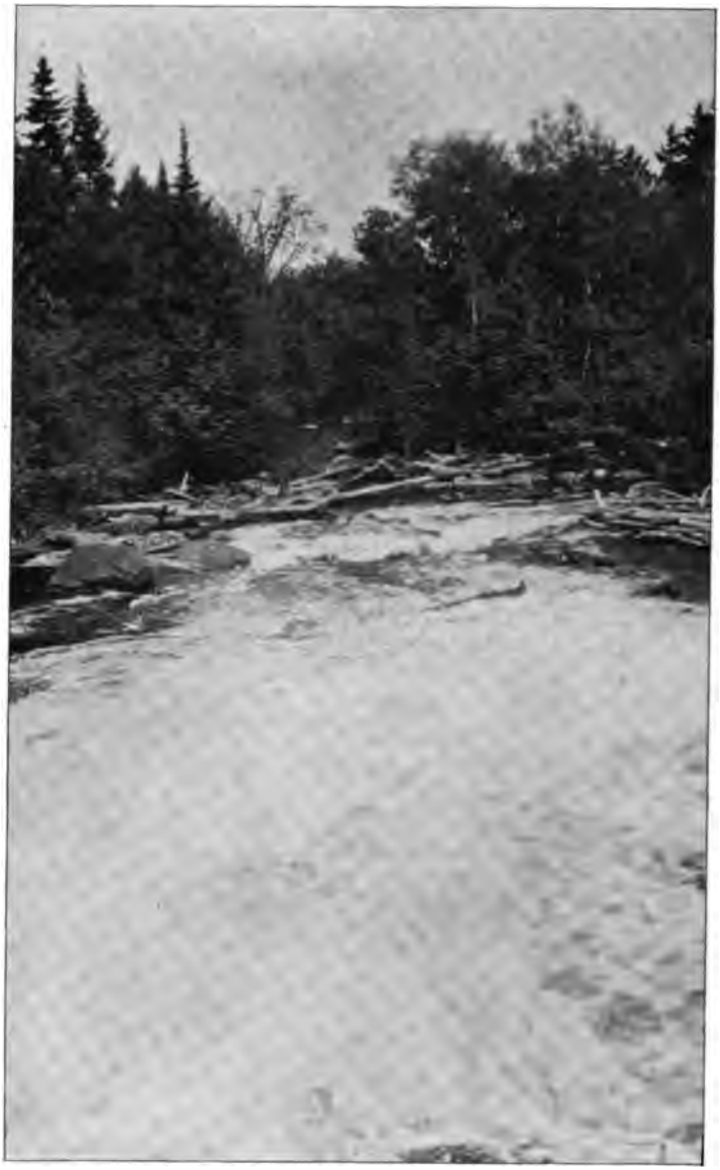
At the foot of this rapids the river flows through a narrow gorge, less than 100 feet wide, with vertical rock banks to a height of from 35 to 40 feet. A dam 30 feet high above low-water level would back water to the tail-race of the Union Falls plant, about 3 miles up stream. A working head of 30 feet would be available. This head, with regulated flow, would produce about 850 horsepower of continuous all-year power, or about 1,000 horsepower for 60 per cent. of the average year. The estimated cost is $100,000, or $100 per horsepower.

Union Falls

A masonry dam about 150 feet long and not over 15 feet high, with an 11-foot steel penstock about 1400 feet long, here creates a gross head of 57 feet. Electric power is developed for use in surrounding towns and villages. This dam creates a small reservoir having an area of about 1500 acres, and a capacity of perhaps 0.50 billion cubic feet.

Franklin Falls

At this place a head of 52 feet is created by means of a masonry dam about 35 feet high, and a 10-foot steel penstock about 300 feet long. Electric power is developed and used with the power from the Union Falls plant. A small amount of storage has also been secured at this plant. The reservoir has an area of about 450 acres, and a capacity of perhaps 0.15 billion cubic feet.



Rapids Below Tefft Pond

PLATE VIII

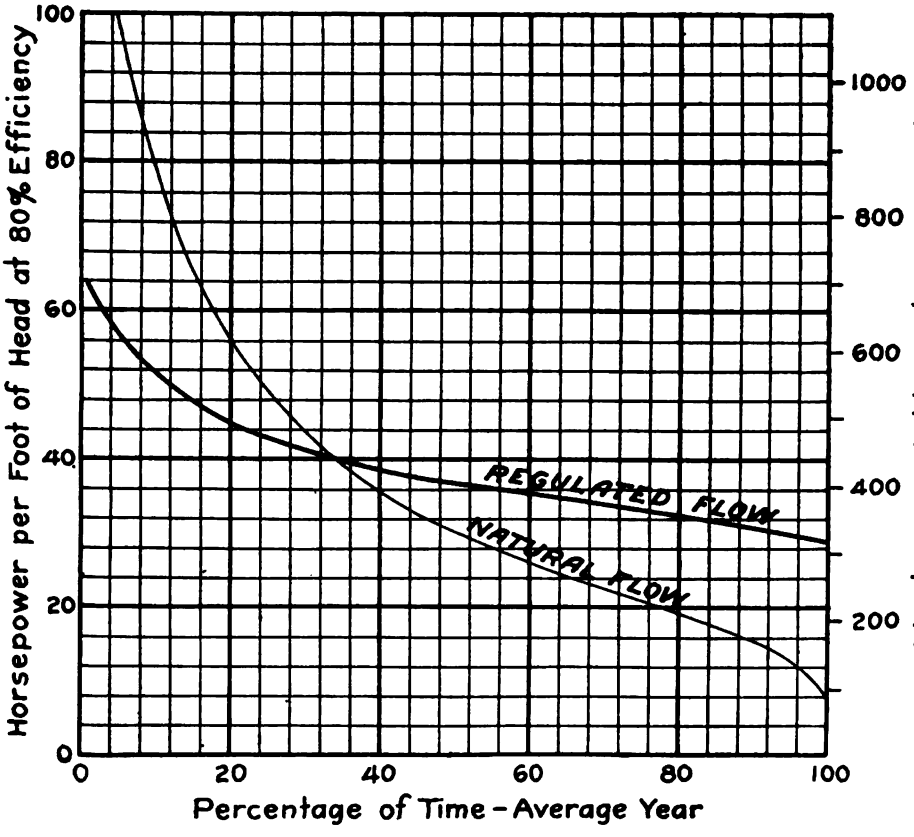
STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

POWER-PERCENTAGE-OF-TIME CURVES
SARANAC RIVER AT TEFFT POND

JANUARY 1915

E. S. Cullings ASST ENGR
A. W. Perkins DIV. ENGR.
APPROVED R. W. Sherman CHIEF ENGR.

NOTE:-
Regulated flow line shows resulting regulation from 4.0 billion cubic feet of storage in proposed Saranac Lake Reservoir.



Pyramid Rapids Between the Franklin Falls reservoir and the foot of the Bloomingdale swamp, the river has a fall of 45 feet. Of this head, at least 34 feet can be developed by means of a masonry dam 24 feet high, located at a point near the middle of the rapids, with a reinforced concrete or steel conduit about 950 feet long, leading to the power house site. With the proposed regulation, about 750 continuous 24-hour horsepower would be available, and for 60 per cent. of the average year, about 1000 horse power. The estimated cost is $110,000 or $110 per horsepower.

Saranac Lake The flow of the river is here divided between the village pumping plant, located at the easterly end of the dam, and an electric power plant at the westerly end. The power plant is connected with those at Union Falls and Franklin Falls, and has been but little used since the construction of those plants. The pumping plant supplies the village with water, and is operated continuously. The average head is about eleven feet.

EXPLANATION OF TABLE IV

This table shows the principal details of head, wheel installation, estimated streamflow, etc., at each of the present plants and at all undeveloped power sites affected by the proposed Saranac Lake reservoir. The first six columns are self-explanatory. Column VII shows the estimated minimum monthly streamflow, based on the Plattsburg records as explained on page 77. Column VIII shows the amount of continuous 24-hour power available with the head in Column V and the flow in Column VII; Column IX, the amount of power available with the given head and the present wheel installation, a turbine efficiency of 80 per cent. being assumed in each case. Columns X and XI show the estimated flow and wheel capacity available for 60 per cent. of the average year, and Column XII, the amount of power, in horsepower-years per annum, which would be produced with the given flow and the installation shown in Column XI. Column XIII shows the amount of power which the proposed regulation would add to the output of the natural flow of the stream with the present installation and head. It is to a certain extent a measure of the benefits which would result if the proposed reservoir were to be built for the present plants only. It will be noticed that in one or two instances the apparent benefit amounts to little or nothing. This is due to a relatively high installation to take unusual loads for a short time, or to utilize flood flows during but a short period each year. In these cases, of course, the table does not represent the true benefit received from the more steady flow due to regulation.

Columns XIV and XV are comparable with Columns IV and V, showing the elevation of crest of dam and working head at each point, after the entire available head shall have been completely developed. It should be here noted that all heads which are wholly or partially developed are listed under "Developed Heads," and therefore that where the head shown in Column XV is greater than that in Column V, a portion of the increased power shown in succeeding columns is due to increased head, and should properly be considered as "undeveloped power."

Columns XVI and XVII show the minimum flow and continuous power available with the proposed regulation, and Columns XVIII and XIX, the streamflow and power for 60 per cent. of

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the average year (with heads shown in Column XV). Column XX shows the power supplied by the natural flow of the stream with the head in Column XV and the installation in Column XIX; Column XXI, the additional power afforded by regulation; and Column XXII, the total hydraulic power available after regulation and complete development. As before stated, it has been assumed that an installation which can run at full capacity 60 per cent. of the average year represents "complete development." Column XXIII shows the auxiliary installation necessary to maintain the full-capacity output shown in Column XIX, and Column XXIV shows the amount of auxiliary power required in the ordinary year for continuous year-round power.

At the foot of Column XXI, it is seen that after complete development the proposed reservoir would increase the total power output by 7,310 horsepower-years per annum. The estimated cost of the reservoir is $614,000; therefore, the "storage investment" amounts to but $84 per horsepower for this increased power, which, in fact, replaces costly auxiliary power.

III. RIVER IMPROVEMENT

CANASERAGA CREEK

The construction work in this improvement was abandoned in its entirety by the contractor and his subcontractors in January, 1914. On May 1, 1914, the Commission directed its chief engineer to proceed with the work by day's work, that is, by procuring the necessary plant and employing necessary foremen, mechanics and laborers and by keeping distinct and separate accounts of the cost thereof in order that it may be charged against the contractor.

The only plant left on the work by the contractor was a large floating dredge sunk in the new channel when the work was abandoned. This dredge was badly out of repair and in a dilapidated condition and was not in any event suited to the completion of the work which the contractor had intended to perform with it. None of the contractor's plant has been used in the completion of the work.

A large drag line excavating machine was procured for use in lieu of the abandoned dredge. Two small steam shovels were procured for excavating the smaller channels. The work is still in progress at the end of the fiscal year.

The interruption caused by the abandonment of the work by the contractor, coupled with the uselessness of the dredge left by him on the work sunk in the channel, were serious matters. The procuring of an entire construction plant and the organization of a force to complete the work were expensive and necessarily consumed considerable time. Consequently, but a small portion of the work was gotten under way until about the 1st of July, after which date the rate of progress was much better than had been made by the contractor in 1913.

The parts of the work left to be done at the time of the abandonment were the most difficult and expensive of all the work in the improvement and could not have been done by the contractor except at a cost much greater than contract prices. The work abandoned consisted largely of those parts of the channels to be excavated which were either too narrow and shallow or too wide and deep to be done by the machinery used by the contractor. By reason of the prospective inevitable loss in the execution of the work abandoned, a considerable part of it had probably been willfully delayed by the contractor for the purpose of deferring the meeting of such loss. These facts no doubt had a bearing with the contractor in his determination to abandon the work.

It is expected to complete all of the work excepting that to be done by the drag line excavating machine before winter and to complete the drag line excavating work during the winter or early spring of 1915. The cost of doing the work abandoned by the contractor will inevitably be much higher than his contract prices therefor.

The contractor filed a claim with the State Board of Claims in May, 1914, this being equivalent to a suit against the State. The case is not yet on the calendar and as to when it will be tried is at present unknown.

The great benefits to the Canaseraga Creek Improvement District growing out of the excavation of the several channels are more apparent as time goes on.

The Conservation Law makes no provision for the payment of interest during the construction period excepting from principal.

The dilatory progress of the work by the contractor followed by his abandonment thereof when it was far from completed will cause the date of completion to be about two years later than it would have been if the work had been finished by the contractor at the contract time, namely, May 20, 1913.

The result is that $40,000 from the Canaseraga Creek Improvement fund has been so far paid out for interest on the bonds; but some portion of this sum may be considered as having been paid from the proceeds of interest earnings on bank balances. Approximately half of it ($20,000) is from the principal of the bonds.

Notwithstanding this large payment of interest from principal the available funds are sufficient, we believe, to complete the construction of the improvement if the work on section No. 1 as originally designed is omitted. This can in our judgment be omitted without injury to the project except that possibly cut-off No. 2 should be made.

The cost of construction has not, nor will it reach the originally estimated sum for construction even if the scheme is carried out in its entirety.

THE FUND

Proceeds of sale of bonds plus interest earnings on bank balances and other items	$225,574 90
Payments to close of fiscal year	182,654 25
Balance as per State Comptroller October 1, 1914	$42,920 65

IV. DRAINAGE

During the year 1913–14 the three petitions described below were filed under article 8 of the Conservation Law (drainage).

NEW PALTZ PROJECT

Surveys, plans and estimates were prepared for this project by the cooperation of Cornell University, College of Agriculture, and the office of Drainage Investigation, U. S. Department of Agriculture. A petition from the owners was presented to this Commission in April, 1914. This petition was found to be faulty in form, but an engineer was detailed to look over the proposed work and an informal hearing arranged to explain to the owners the necessity for a new petition. The amended petition has not yet been received.

CICERO PROJECTS — RECONNAISSANCE

Although the petitions did not conform to the requirements of the law, an engineer was detailed to make an examination of the projects, pending the filing of a new petition in due form. The following is extracted from the report of the engineer.

CLAY — CICERO PROJECT — PHYSICAL FEATURES

The following data are taken from the Syracuse Quadrangle of the U. S. G. S. maps (see plate XI).

Watershed area tributary to swamp, about 32 sq. mi.

Elevation of surface of swamp, U. S. G. S. Datum, 365 feet.

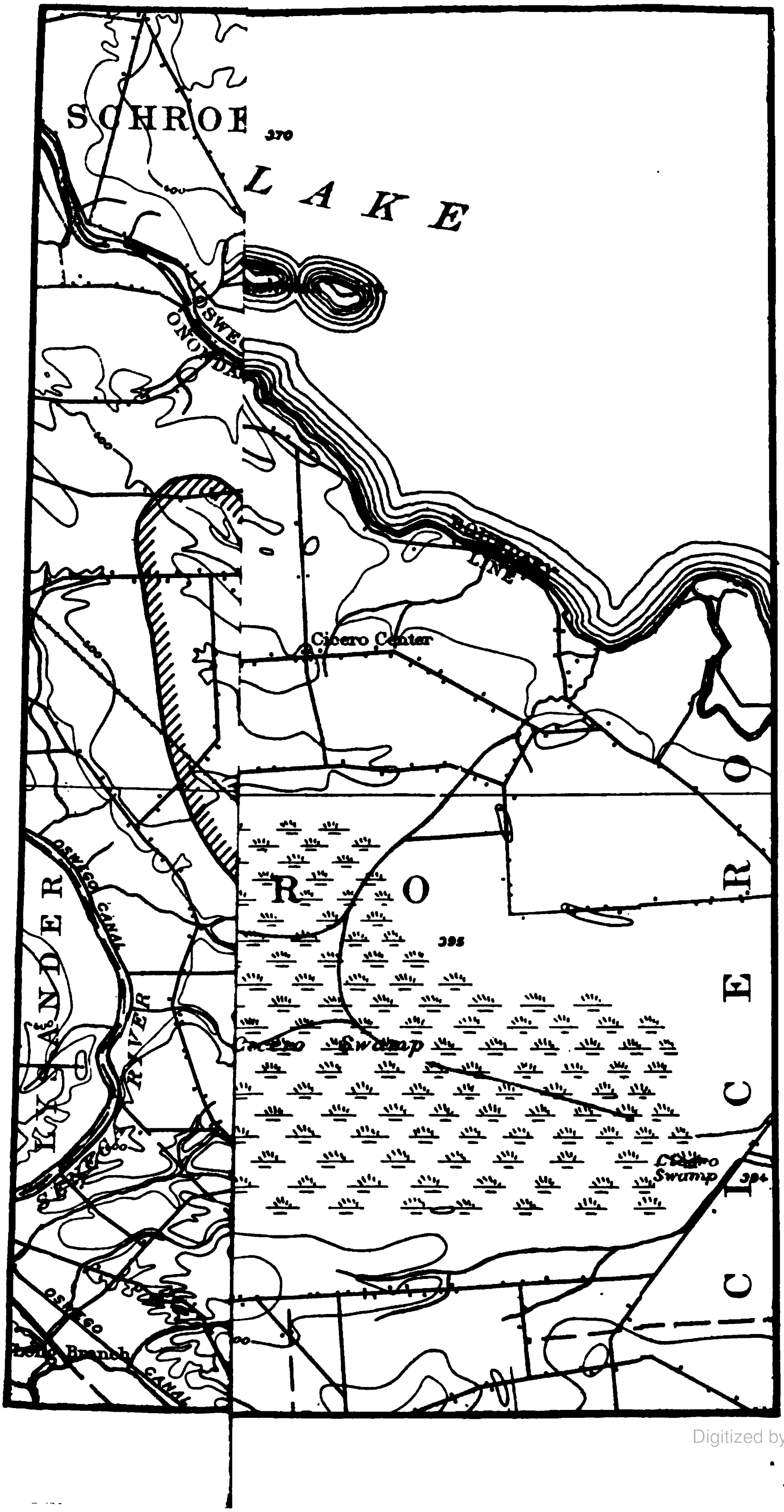
Elevation of surface of swamp, Barge Canal Datum, 366 feet.

Area of swamp about 1,500 acres.

It will be observed that Mud creek, the stream which carries off the drainage from this area, flows into Oneida river just below the old Oak Orchard dam. This is also below the new Barge Canal dam at Caughdenoy.

Owing to the large areas of water surface in Oneida lake and the Finger lakes, Oneida river and Oswego river are not subject to violent fluctuations, and relative elevations of water surfaces change very gradually throughout the seasons of the year.

The Oneida lake and river form part of the new Barge canal and the water surfaces are controlled by dams at Caughdenoy and Phoenix. The Phoenix dam, which controls the pool into which Mud creek flows, has been raised 3.87 feet. The elevation of the crest is 363 Barge canal datum, and that is the pool level to be maintained. Part of the Phoenix dam is movable and it is probable that the pool level will not be allowed to vary far from elevation 363 at least during the navigation season. The slope of the water surface up stream from the dam will depend upon the


SCHROE
370
LAKE
OSWE
ONONDA
400
BOUNDARY
LINE
Cicero Center
R O
395
Cicero Swamp
Cicero Swamp
394
CICERO
LYSANDER
RIVER
OSWEGO CANAL
SENECA
OSWEGO
Long Branch
CANAL

amount of water flowing. Since 1904 the Barge canal authorities have maintained records of the daily elevations of the water surfaces above the Phoenix dam and below the old Oak Orchard dam.

The following data are taken from those records:

TABLE V
Elevations of Water Surface

	OSWEGO RIVER ABOVE PHOENIX DAM		SIMULTANEOUS ELEVATIONS ONEIDA RIVER BELOW OAK ORCHARD DAM	
	Highest	Lowest	Highest	Lowest
1912	365.8	362.0	365.9	363.8
1911	363.0	360.4	365.5	360.8
1910	362.4	359.7	364.3	360.4
1909	363.8	360.2	366.6	360.7
1908	363.3[*]	359.8	365.8	361.1

[*] Highest recorded, 363.6, but is probably in error.

TABLE VI
Differences in Elevation Between Water Surfaces Above Phoenix Dam and Below Oak Orchard Dam

	1908	1910	1912
May 1	3.08	1.93	4.39
10	2.98	2.43	2.34
20	2.38	0.88	1.89
June 1	2.18	1.43	1.19
10	1.58	1.13	1.24
20	1.88	1.03	0.89
July 1	1.63	0.68	0.04
10	1.23	0.33	—0.01
20	1.33	0.21	—0.21
Aug. 1	1.33	0.78	0.19
10	0.98	1.33	0.39
20	0.98	0.48	0.09
Sept. 1	0.73	0.68	—0.03
10	1.18	0.08	0.02
20	0.08	—0.03	0.02
Oct. 1	0.73	0.49	0.57
10	0.58	0.13	0.67
20	0.28	0.53	0.27

PROPOSED DRAINAGE PROJECT

Before outlining a scheme for drainage, it should be fully understood that such a scheme can be only very tentative until more precise levels are available. The elevation given on the U. S. G. S. sheet for the surface of the swamp may refer to the water surface in the spring of the year or to the surface of the muck at some low point. The difference between these might be as much as 2 feet. Taking 365 as referring to the average surface of the muck, it is suggested as a preliminary plan that drainage be undertaken by a combination of gravity and pumping systems. A main ditch would be dug along the south side of the swamp using the excavated material to form a dike on the north side of the ditch. This ditch would extend to Oneida river and would carry the main part of the run-off at all times. The water not intercepted by the main ditch would be taken care of by a secondary ditch extending up through the center of the swamp from Euclid. At Euclid a pumping plant would raise the water from the secondary ditch to the main ditch.

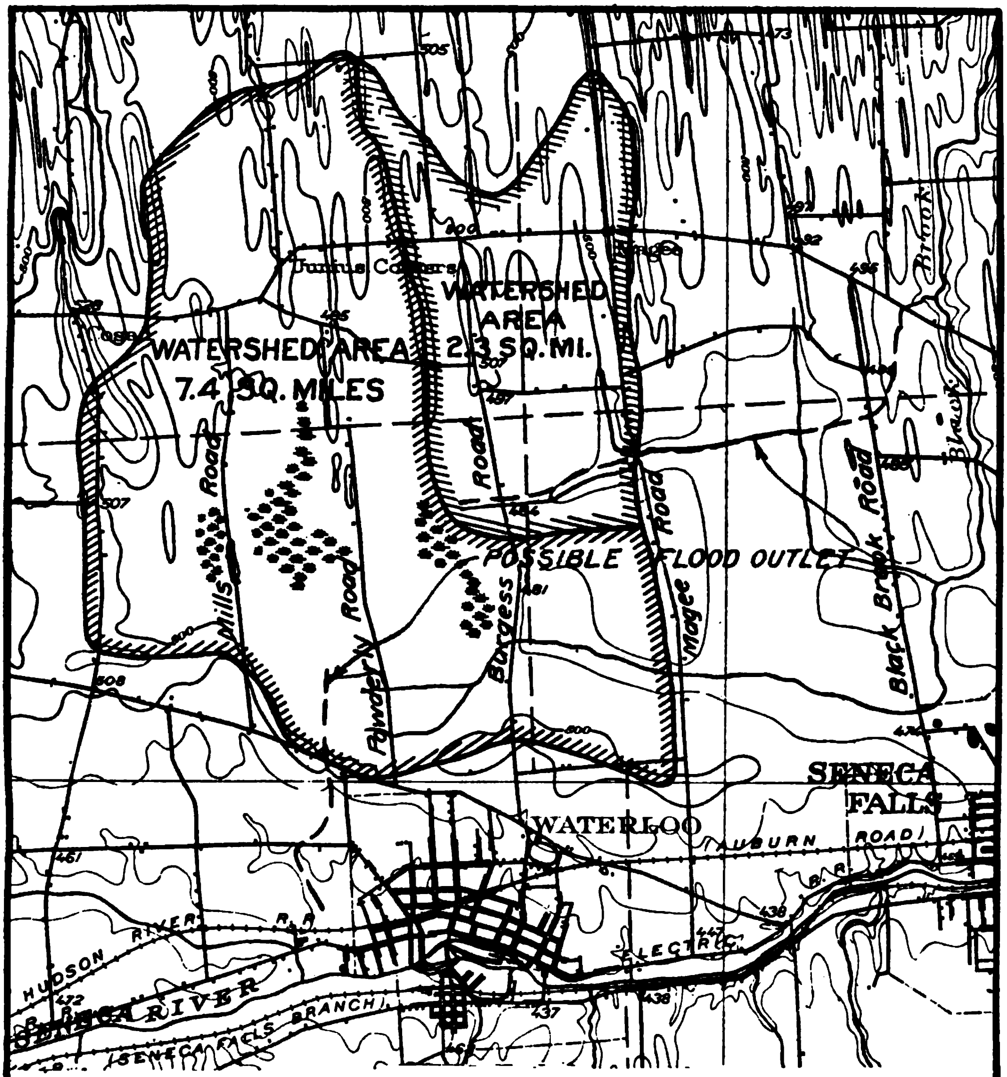
It will be seen from the previously quoted differences in water surface elevations that in 1908 it would have been necessary to pump practically the entire season, because

363 (elevation of Phoenix pool)
+ 1.0 to 1.5 (slope in river)
+ 0.5 to 2.5 (slope in main ditch)
= 365 to 367, while the surface of the swamp is only 366 (B. C. datum).

In years like 1910 and 1912, it would probably be unnecessary to pump during July, August and September.

For the pumping plant, two units each capable of handling about 100 cubic feet of water per second under a head of five feet is suggested. It would be very desirable to be able to vary the speed of the pumps. The centrifugal pump is the only type adapted to economically handling this quantity of water under the low head. The head will vary between 1 ft. and 5 ft. and the speed of the pump should be adjusted accordingly. A rough estimate of the cost of the pumps, housings, foundations and piping is $5,000. The high tension line from the Salmon river development crosses the swamp along the side of the R. W. & O.

PLATE XII



STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

WATERLOO DRAINAGE PROJECT

0 1 2 3
SCALE OF MILES

JANUARY 1915

E. H. Sargent ASST. ENGR.

A. H. Perkins DIV. ENGR.

APPROVED R. W. Sherman CHIEF ENGR.

R. R. Transformers and line to the plant would probably bring the cost up to around $8,000 to $10,000. If a satisfactory rate could not be obtained for electric current, gasoline or oil could be used, and the plant cost would probably not exceed $5,000.

It is not deemed desirable to try to estimate the quantity of excavation required until more data are available. There was quite a rapid current in Mud creek when seen, indicating considerable fall in the water surface and the surface of the swamp.

Business Features.— This project is located so close to Syracuse that land values are high. So far as could be ascertained there was unanimity of sentiment that the swamp should be drained, and it was understood that a new petition in proper form would be presented to the Commission at a later date.

UPPER CICERO PROJECT

Physical Features.— This swamp has an area of 2,500 acres or more. Its drainage appears extremely simple, it being a mere matter of excavating a suitable ditch. The accompanying map shows a sketch of the proposed system, consisting of a main ditch across the ridge between Oneida lake and the swamp with laterals in each direction.

Business Features.— Nearly all the area in this swamp is owned by a private corporation. A few hundred acres of the portion draining toward the west has been cleared and some is under cultivation.

These projects are worthy of further investigation and will be taken up by the Commission when corrected petitions have been received and funds are made available.

WATERLOO PROJECT

About one mile north of the village of Waterloo is a tract of muck land of about 1,500 acres which has been partially drained and placed under cultivation. A considerable portion of it, however, is subject to overflow at such frequent periods that it has been allowed to revert to pastures or hay land, and loss of crops on nearly the whole area frequently occurs. A request that the Commission should take cognizance of these conditions and suggest a method of relief was received by the Commission from two of the interested parties. An engineer was detailed to examine the locality and report. The accompanying map shows the area and a preliminary plan for relief. A form of petition was also prepared in this office and forwarded to the parties for signatures. Upon receipt of amended petition and appropriation of funds for such work by the legislature, this project should be further investigated.

The activities being displayed by the owners of swamp lands should be encouraged and sufficient funds should be provided to permit of promptly responding and following up by surveys and complete investigations where the preliminary investigations indicate the probability that the lands can be drained at a price well within the value of the benefits conferred.

TABLE VII

Swamp Areas in New York State by Counties

Counties	*Acres*	*Counties*	*Acres*
Albany	....	Onondaga	15,567
Allegany	....	Ontario	3,719
Broome	457	Orange	4,614
Cattaraugus	....	Orleans	11,660
Cayuga	13,678	Oswego	46,680
Chautauqua	10,010	Otsego	1,036
Chemung	202	Putnam	5,293
Chenango	1,599	Queens	40
Clinton	11,758	Rensselaer	380
Columbia	3,880	Richmond	....
Cortland	344	Rockland	2,258
Delaware	583	Saratoga	1,995
Dutchess	3,357	Schenectady	....
Erie	....	Schoharie	363
Essex	152	Schuyler	571
Fulton	6,768	Seneca	11,530
Franklin	....	Steuben	162
Genesee	12,350	St. Lawrence	25,512
Greene	....	Suffolk	1,549
Hamilton	....	Sullivan	....
Herkimer	3,498	Tioga	....
Jefferson	5,163	Tompkins	651
Kings	....	Ulster	2,301
Lewis	20,465	Warren	2,177
Livingston	1,917	Washington	1,547
Madison	4,641	Wayne	16,850
Monroe	8,951	Westchester	3,669
Montgomery	23	Wyoming	....
Nassau	....	Yates	3,223
New York	....		
Niagara	1,770	Total	286,583
Oneida	11,670		

WATER SUPPLY AND SEWERAGE

Immediately below will be found the report of the Conservation Commission to the Charlton Union Water District.

For the decisions of the Commission made in the execution of the laws for securing the equitable apportionment of the water supply resources of the State, consult Appendix A.

For the actions taken by the Commission on Sewerage Applications, see Appendix B.

CONSERVATION COMMISSION REPORT TO CHARLTON UNION WATER DISTRICT

ALBANY, N. Y., *June* 15, 1914

Charlton Union Water District,
The Mayor of the City of Cohoes
The Mayor of the City of Watervliet
The President of the Village of Green Island
The Supervisor of the Town of Waterford
Ex Officio Trustees.

GENTLEMEN.—The Charlton Union Water District, having been formed and organized in compliance with the provisions of Article 9-A of the Conservation Law, being Chapter 233 of the Laws of 1913, on the 23rd day of June, 1913, petitioned the Conservation Commission under the provisions of Section 531 of said law, a copy of which petition is attached hereto as Appendix B.

Acting upon said petition as a whole and the following paragraph thereof in particular, namely:

> "The petitioner hereby applies to the Conservation Commission to investigate the proposition of a supply of water to said Union Water District under the provisions of said law (Chapter 233 of the Laws of 1913), and to cause surveys, maps, plans and estimates to be made, and such further or other information as said Commission may deem advisable; and your petitioner will forever pray, etc."

the Conservation Commission did on the 8th day of July, 1913, adopt a resolution as follows:

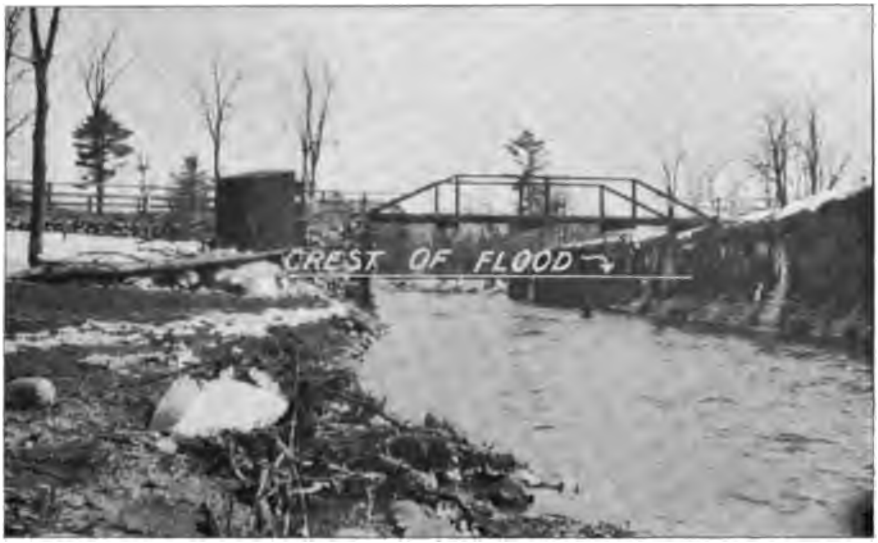
> "WHEREAS, The cities of Cohoes and Watervliet, together with the Village of Green Island and the Town of Waterford have under the provisions of Chapter 233 of the Laws of 1913, formed the Charlton Union Water District, and duly organized as such;
>
> "AND WHEREAS, Said Charlton Union Water District has petitioned the Conservation Commission under the provisions of Section 531 of the law aforesaid;
>
> "AND WHEREAS, The Counsel to this Commission did, on July 8th, examine said petition and all the papers accompanying it, and found such application to comply with the provisions of said law;
>
> "AND WHEREAS, This Commission by reason of a reconnaissance and investigations, and also examinations of the maps of the United States Geological Survey, and otherwise, has become familiar with the possibilities of supplying such Union Water District with water under the provisions of the said law by constructing a reservoir on the Alplaus Kill in Saratoga County and conducting the water therefrom to distributing reservoirs for the four municipalities in said district;
>
> "AND WHEREAS, This Commission appreciates the importance of the construction of a 'Conservation Water Works' for the promotion of the health and prosperity of the municipalities in said Union Water District;
>
> "NOW, THEREFORE, RESOLVED that the Chief Engineer be and hereby is directed to immediately proceed to make such preliminary investigations, surveys, maps and plans as are set forth in the second paragraph of Section 531 of said law."

Acting under said resolution the Chief Engineer caused careful examinations and surveys to be made and designed a gravity water supply system with filtration in compliance with the Conservation Law, and made a report thereon to the Conservation Commission, which report is made a part of this report by the Conservation Commission to the Charlton Union Water District, and is as follows:

Alplaus Kill at High Mills Dam

Alplaus Kill, Looking Down-Stream From Dam Site

UNIV. OF MICH.



Alplaus Kill near Charlton Looking Down-Stream. White Line indicates Maximum Gage Height for March 28, 1914. Corresponding Flow, 591.4 Mil. Gal. Per Day

Alplaus Kill — ¼ Mile above Dam site. Buildings on right will be submerged by Proposed Reservoir

OF

CHIEF ENGINEER'S REPORT ON SURVEYS, INVESTIGATIONS AND DESIGN FOR CONSERVATION WATER WORKS FOR CHARLTON UNION WATER DISTRICT

JUNE 8, 1914

To the Honorable Conservation Commission:

GENTLEMEN.— Acting under a resolution adopted by the Commission on the 8th day of July, 1913, based upon a petition made by the Charlton Union Water District to the Conservation Commission, under the provisions of Article 9-A of the Conservation Law, and particularly under the last paragraph of said resolution, which paragraph reads as follows:

> "RESOLVED, That the Chief Engineer be and hereby is directed to immediately proceed to make such preliminary investigations, surveys, maps and plans as are set forth in the second paragraph of Section 531 of said law."

your Chief Engineer reports as follows:

SURVEYS, INVESTIGATIONS AND DESIGNS

Careful surveys, investigations and designs have been made for a gravity water works with filtration system, with the Alplaus Kill as a source of supply.

Promptly following the adoption of the aforesaid resolution Assistant Civil Engineer F. D. Porter and surveying party were put into the field and a temporary local office opened at Charlton. The work has proceeded from that time to date as funds were available.

WATER SUPPLY NEEDS OF THE CHARLTON UNION WATER DISTRICT

The population of the municipalities in the Charlton Union Water District is set forth in the petition of the trustees thereof to the Conservation Commission as follows:

City of Cohoes	24,709
City of Watervliet	15,074
Town of Waterford	6,128
Village of Green Island	4,737
Total	50,648

In the petition it is estimated that the population ten years hence will be:

City of Cohoes	26,000
City of Watervliet	20,000
Town of Waterford	7,000
Village of Green Island	5,000
Total	58,000

In designing a water works system it is customary and proper to anticipate a greater population at some future period, such as ten or twenty years hence, and give some heed to possible additional sources of supply for a much greater population at more remote periods in the future. From a financial standpoint it is not ordinarily advisable to make provision at the time of the original construction for an increased population at a period more than twenty years hence, for the reason that the compound interest on the cost of excessive construction would equal the cost of construction in about twenty years. Thus, by waiting to the end of twenty years, when the additional construction would be actually needed, a financial saving of about one-half would be effected in the cost of an additional supply needed only beyond that period of time. In considering the present population of 50,648 and the population estimated at ten years hence as 58,000 (as stated in the petition) a further assumption has been made that twenty years hence the population would be 75,000 and the works as designed are on that basis of population.

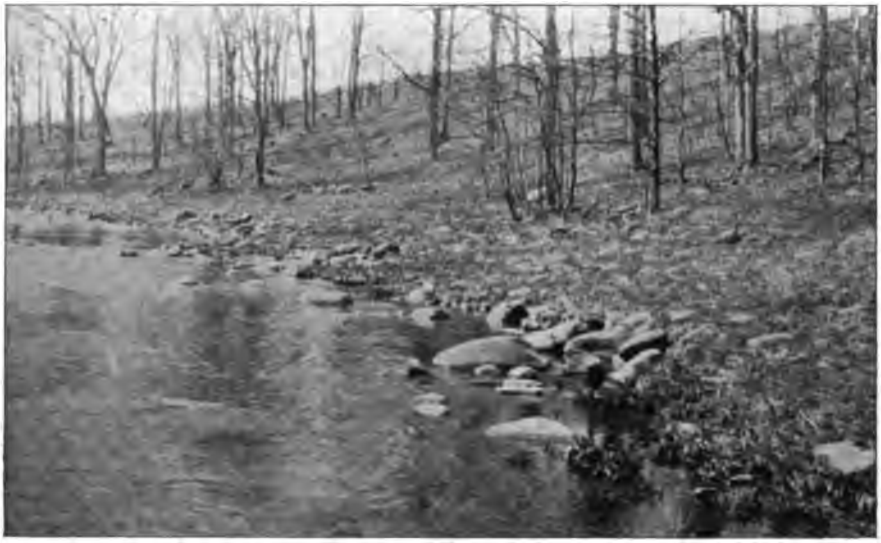
The petition further estimates the per diem consumption of water by the district to be:

City of Cohoes	3,088,625	Gal.
City of Watervliet	1,884,250	"
Town of Waterford	766,000	"
Green Island	592,125	"
Total	6,331,000	"

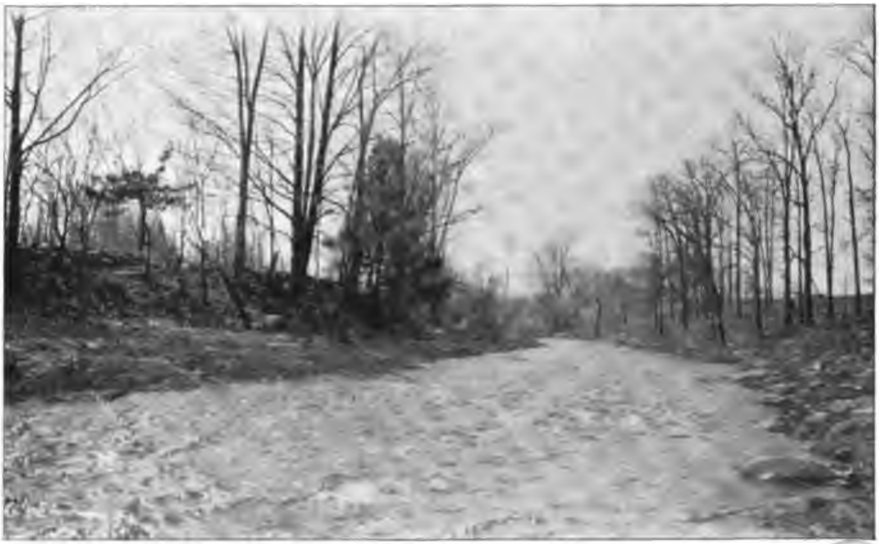
Alplaus Kill at High Mills Dam

Alplaus Kill near Charlton, looking up-stream. Photograph taken April 4, 1914.
Measured Discharge, 103.4 Mil. Gal. Per Day.

UNIV. OF MICH.



Alplaus Kill View Up-Stream at Dam Site



Alplaus Kill View Up-Stream at Dam Site

UNIV. OF MICH.

The petitioner further estimates the per capita per diem consumption at 125 gallons. Records of the Cohoes Filter Plant indicate a per capita per diem consumption of about 300 gallons. The Watervliet Hydraulic Company claims to pump 170 gallons per capita per diem for Watervliet. Either these records are in error or there is a great leakage and waste of water in those two municipalities. The trustees of the Charlton Union Water District estimate 125 gallons per capita per diem, but ample provision has been made in the design for a much greater supply. Nevertheless, it is believed to be possible, by checking leakage and waste, and thus reducing the consumption to reasonable liberal necessity, that 125 gallons per capita per diem would suffice. In this connection, the following tabulation of the consumption of water in a considerable number of municipalities is of interest and importance:

Municipality	Population	Daily Consumption per Capita
Kingston, N. Y.	25,900	230
Albany, N. Y.	100,200	220
Chicago, Ill.	2,185,200	225
Erie, Pa.	66,500	205
Bridgeport, Conn.	82,000	210
Philadelphia, Pa.	1,599,000	205
Auburn, N. Y.	34,600	185
Camden, N. J	80,000	165
Pawtucket, R. I.	50,000	140
Lancaster, Pa.	45,000	140
Binghamton, N. Y.	48,400	140
Boston, Mass	674,400	130
Perth Amboy, N. J	40,000	125
Schenectady, N. Y.	72,800	125
Haverhill, Mass.	42,000	120
Harrisburg, Pa.	64,100	120
Pittsfield, Mass	32,000	110
Bayonne, N. J	55,500	110
Holyoke, Mass	56,900	105
New York City	4,910,000	100

Municipality	Population	Daily Consumption per Capita
Yonkers, N. Y.	77,500	95
Poughkeepsie, N. Y	27,900	90
Syracuse, N. Y.	137,200	90
Jamestown, N. Y.	31,200	88
Salem, Mass.	43,600	90
Utica, N. Y.	74,400	85

(The above tabulation taken from Engineering News, Aug. 22, 1912.)

A supply of 100 gallons per capita per diem is enough for all the usual needs of a municipality. In some cases the use for steam boilers, laundries, some lines of manufacturing, etc., may make some greater quantity necessary.

For the Charlton Union Water District provision has been made for 200 gallons per capita per diem for 75,000 inhabitants, amounting to fifteen million (15,000,000) gallons per day. This is on the basis of twice the rate of consumption that should take place under ordinary conditions, also on an increase of 50% in the population.

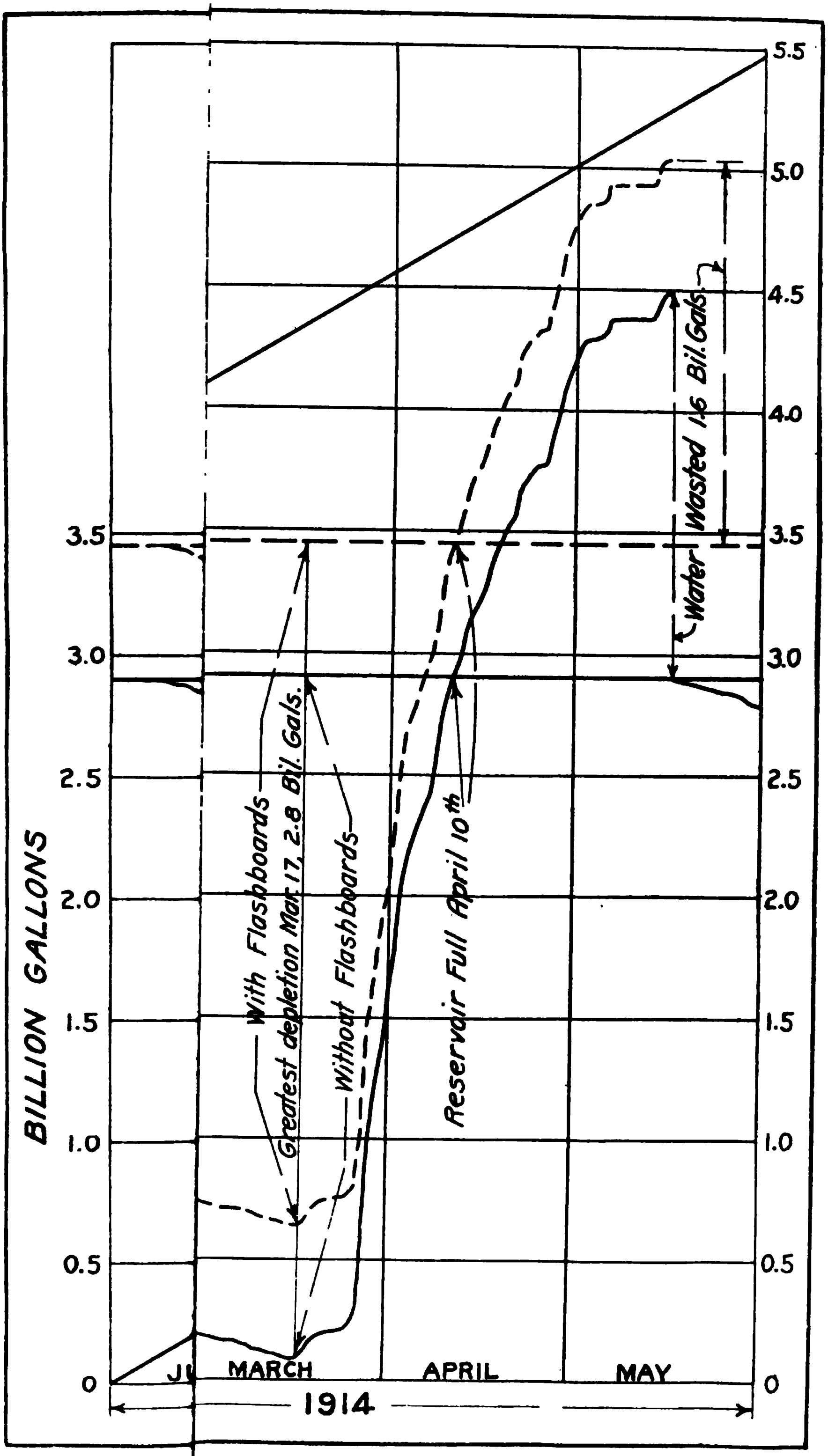
A water works system which will supply 200 gallons per capita per diem to 75,000 inhabitants, involves an investment in the original cost of the works as high as can be justified.

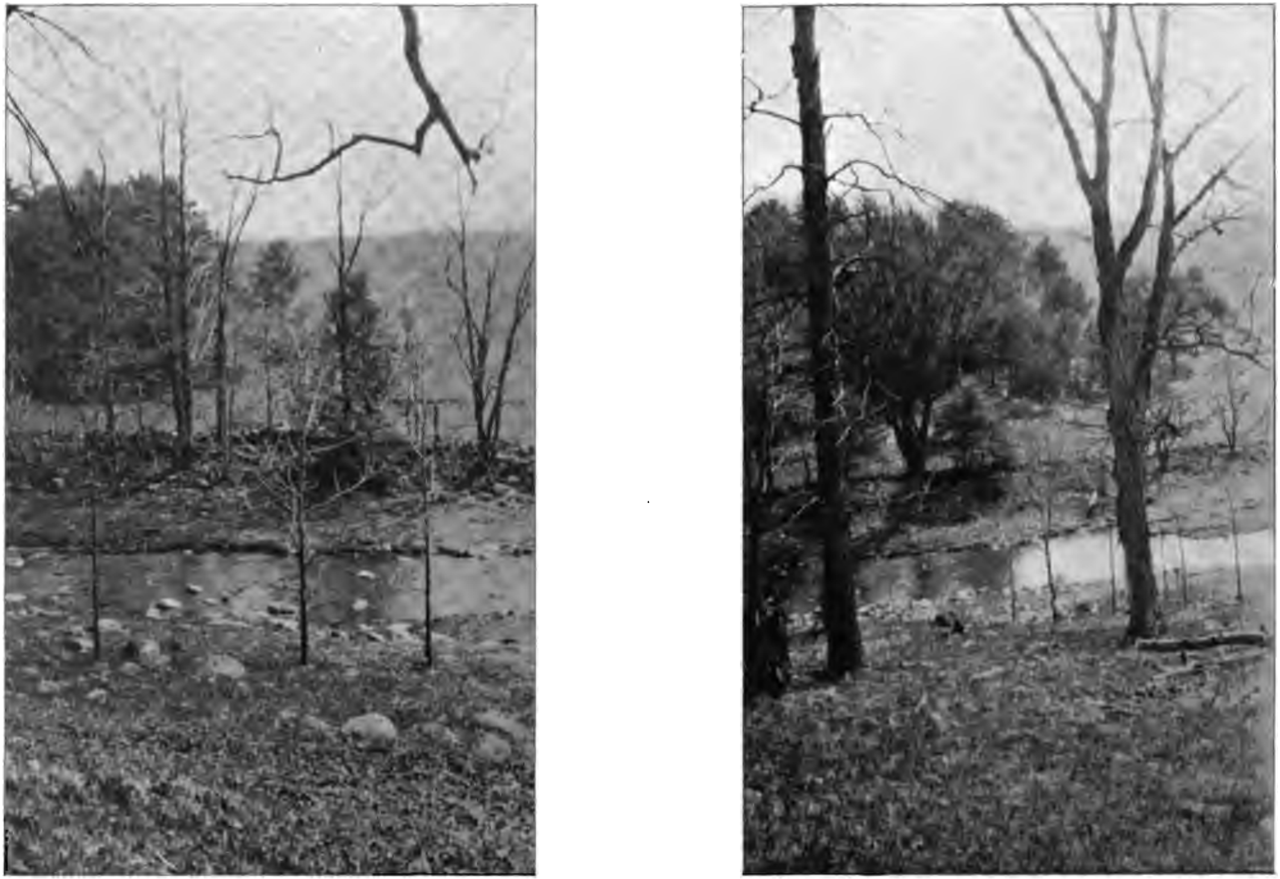
SOURCE OF SUPPLY — ALPLAUS KILL

The Alplaus Kill rises in the southwestern part of Saratoga county at an elevation of about 800 ft. above sea level, and flows in a southeasterly direction, entering the Mohawk river near Rexford Flats. Near Charlton the valley of the Alplaus Kill narrows sufficiently to afford a suitable and desirable dam site, while above this point the valley is broad and flat, thus affording a large basin for a storage reservoir. The drainage area or watershed above this point is approximately 25 square miles.

A stream gauging station was established August 12, 1913, by the Conservation Commission in co-operation with the Water Resources Branch of the United States Geological Survey at the highway bridge crossing Alplaus Kill about 3,000 ft. below the

PLATE XIII


BILLION GALLONS
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
With Flashboards
Greatest depletion Mar. 17, 2.8 Bil. Gals.
Without Flashboards
Reservoir Full April 10th
Water Wasted 1.6 Bil. Gals.
JU
MARCH
APRIL
MAY
1914



Two Views Across Alplaus Kill Valley at Dam Site

site of the proposed dam. This is a standard sharp crested weir with a "V" notch for low water flows. An automatic water stage register with suitable shelter is located on the bank for recording the depths of water on the crest of the weir. Continuous records from August 12, 1913, to June 1, 1914, have thus been obtained, to which have been added the estimated flow from June 1st to August 12th, 1913, obtained by comparison with other similar watersheds. A detailed tabulation of these estimates and records will be found as "Appendix C" hereof. This table shows that the total flow for the year ending May 31, 1914, was six billion nine hundred seventy-four million five hundred thousand (6,974,500,000) gallons, or an average of over nineteen million (19,000,000) gallons per day, being an excess of four million (4,000,000) gallons per day over the estimated requirement of fifteen million (15,000,000) gallons per day. The measurements are accurate and reliable as made from August 12, 1913, to June 1, 1914, and may be safely depended upon for future years for the reason that the summer and fall of 1913 were remarkably dry, and there is no reason to believe that the flow of water in any future year will be any less than the measured and estimated quantity for the year ending with May, 1914.

The monthly Weather Review of the United States Weather Bureau for August, 1913, on page 1133, referring to the drought in the State of New York for that year, reads as follows:

> "Considering the extent of territory affected as well as the reduction in the yield of staple crops and pastures and the lowering of the water supply, it is believed that this summer's drought has been the most serious experienced in the State for at least 40 years.
>
> "The drought of 1913 was remarkable both in its duration and in the time of its occurrence, covering nearly three months and extending well over the maturing period of important crops. It began to retard the growth of vegetation quite generally by the second week in June and, in spite of occasional rains, became almost gradually worse until the 22nd or 23rd of August, when heavy rains brought decided relief in most parts of the State. In some sections, however,

> the drought remained unbroken until in September — so late that no amount of rainfall could bring the stunted crops to maturity.
>
> "In many sections of the State pastures failed completely and cattle and horses had to be fed full winter rations for several weeks. Almost the entire State suffered some loss in pastures and more or less reduction in the yield of staple crops, particularly of those that matured in the latter part of the season such as corn, buckwheat, pears, apples, peaches, and fall potatoes. In many localities one or more crops were reported as being practically failures. In some of the central and eastern counties the water supply was so reduced that it became difficult to secure enough for the most urgent needs in cities and villages, the use of water for sprinkling lawns and flushing streets having been discontinued, while farmers in many places were obliged to haul water from a distance, as most wells, springs, and creeks were dry. A number of correspondents report that wells and streams became dry that were never before known to fail."

A map published in connection with the weather report quoted shows that the four areas of least rainfall in New York State in the summer of 1913, included the greater part of Hamilton, Warren, Fulton and Saratoga counties; also the watershed of the proposed Charlton reservoir.

Having determined the minimum annual run-off which can be depended upon in any given twelve months' period at a certain point, and having found that it is equal to or in excess of the total requirements of the municipalities to be supplied, it is then necessary to determine how much of the water must be impounded or stored in a reservoir in order to equalize and regulate the flow to the uniform daily quantity required for consumption.

After exhaustive calculations it has been determined that the reservoir near Charlton should have a storage capacity of three billion (3,000,000,000) gallons, and it has been so designed. It is also necessary to determine an annual date when the reservoir will be full. This would occur almost without exception in the spring of the year, and usually in the month of May. At least

STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

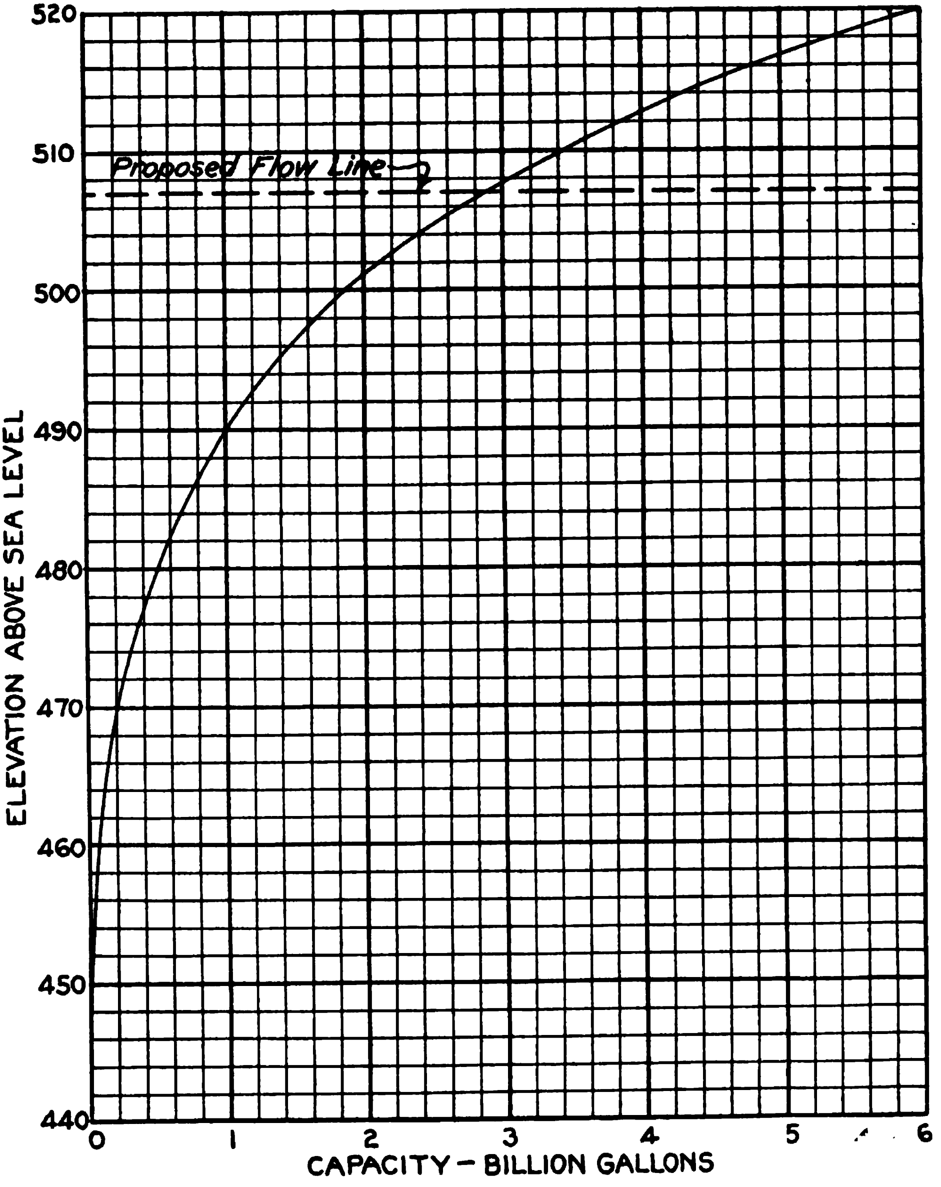
CHARLTON UNION WATER DISTRICT

CAPACITY CURVE

PROPOSED CHARLTON RESERVOIR

MARCH 1914 F. S. Porter ASST. ENGR

R. H. Sherman CHIEF ENGR.



the greater part, or possibly all of the surplus water would pass over the waste weir of the reservoir in the latter part of the spring floods.

In designing the works it is assumed that the reservoir would be full on the first day of June annually. Starting thus, with a full reservoir on the first day of June, we assume that fifteen million (15,000,000) gallons per day would be uniformly drawn therefrom to the first day of June in the following year, which would make a total draught of five billion four hundred seventy-five million (5,475,000,000) gallons.

The supply of water to the proposed reservoir, and the draught therefrom for consumption, are graphically shown on Plate XIII. The straight full line represents the uniform draught of fifteen million (15,000,000) gallons per day, as designed for the total requirements of the district at a period twenty years hence. The irregular line indicates the total quantity of water in the reservoir on any date.

This diagram shows that the reservoir would have been lowest on March 17th, when it would have contained one hundred million (100,000,000) gallons, or by the use of three foot flashboards the minimum remaining would have been six hundred and fifty million (650,000,000) gallons. This would make the lowest water at the dam 23 feet deep, or 43 feet deep if three foot flashboards were used. The capacity of the reservoir is graphically shown on Plate XIV. It also shows that the reservoir would have been full from April 10th to May 16th, 1914, and that one billion six hundred million (1,600,000,000) gallons surplus would have gone over the waste weir.

The foregoing proves that the quantity of water flowing in Alplaus Kill past Charlton, with the proposed reservoir of three billion (3,000,000,000) gallons storage, would certainly supply fifteen million (15,000,000) gallons per day through any year as dry as any known to have occurred in the past.

QUALITY OF WATER

The head waters of Alplaus Kill are remarkably free from sources of pollution, the entire watershed above the proposed reservoir being devoted to agricurture or covered by wood lots. The estimated population of 800 is only 34 inhabitants per square mile of the watershed. While it is desirable that the ownership of a reservoir should include the entire watershed, the great cost thereof, with rare exceptions, has made such a course prohibitive. To purchase the sixteen thousand (16,000) acres on the watershed above the proposed Charlton reservoir would cost a large sum. Instead of acquiring the watershed, it is customary to enforce stringent sanitary inspection and regulation upon such watersheds, which is not expensive. Statute law makes ample provision therefor through the State Department of Health, and otherwise.

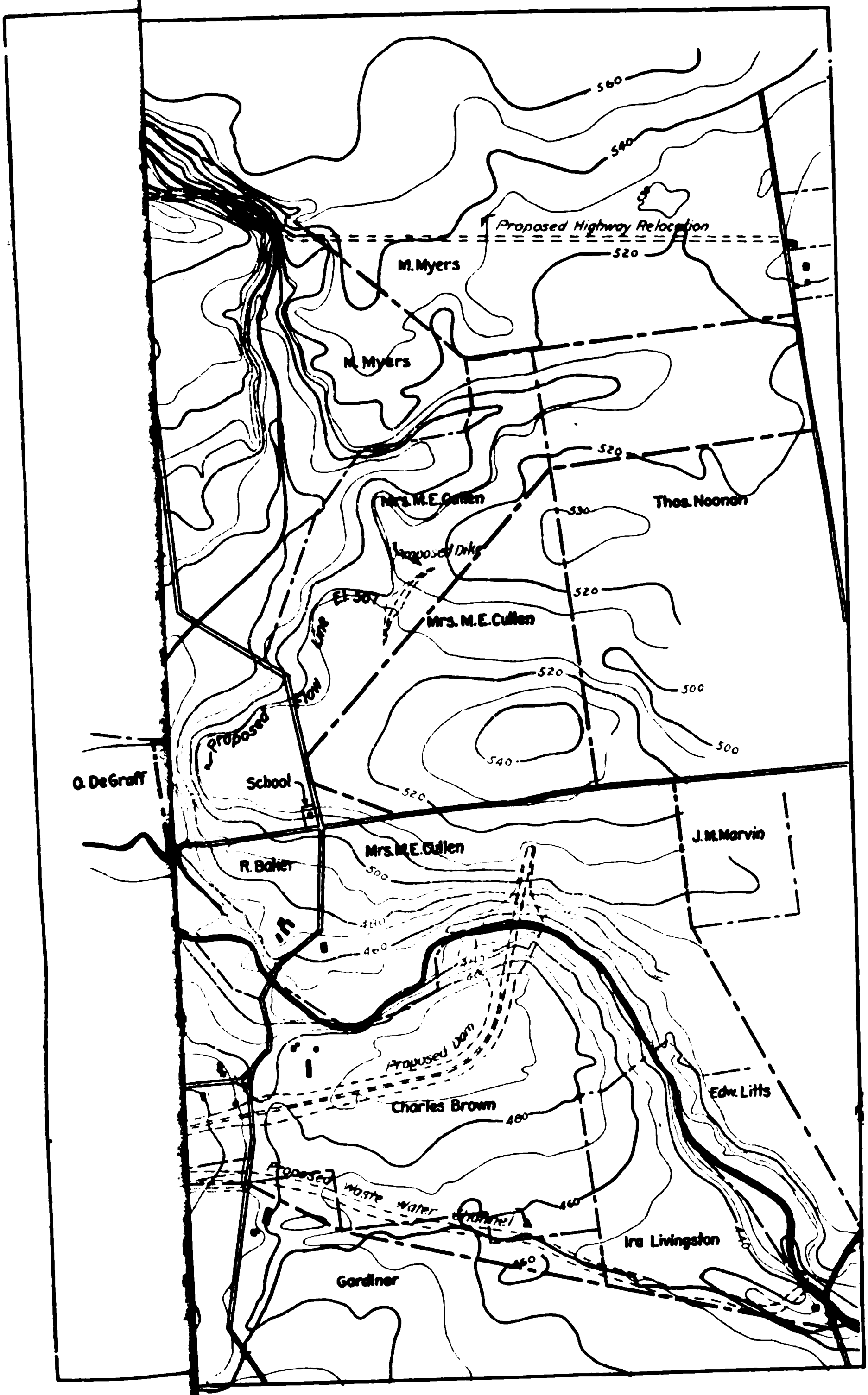
Among the more important gravity supplies similar in nature to the proposed Charlton works, are New York, Troy, Amsterdam, Little Falls, Utica, Syracuse and Rochester.

The Hemlock Lake supply for Rochester has been remarkably satisfactory. The water is clear and so pure that it is used without filtration and no detrimental features to the public health have appeared during the many years of its use. Hemlock Lake is but an immense storage reservoir supplied with water from a large agricultural district quite similar to that about Charlton. The storage is so large that probably the greatest beneficial results derived from such storage in purifying the water are attained. Explanatory of these beneficial results the following quotation is made from United States Geological Survey Water Supply Paper No. 315, entitled "The Purification of Public Water Supplies:"

"IMPOUNDED SUPPLIES

> "Utility of Impounding Reservoirs.— Where the most suitable source of water supply is one or more comparatively small streams, it is frequently necessary to build impounding reservoirs in which to store the heavy spring and fall flow for use during the low periods of summer and winter. In this way use may be made of streams whose normal flow frequently falls below that necessary to supply the demand during certain seasons. Storage is also beneficial in other ways. It greatly minimizes the danger from such pathogenic pollution as the water may be subjected to before it reaches the reservoir, and it effects a substantial improvement in the physical quality of the water.

PLATE XV


560
540
Proposed Highway Relocation
520
M. Myers
M. Myers
520
Mrs. M.E. Cullen
530
Thos. Noonan
Proposed Dike
El. 507
520
Mrs. M.E. Cullen
Proposed Flow Line
520
500
500
540
O. DeGraff
School
520
R. Baker
Mrs. M.E. Cullen
500
J.M. Marvin
480
460
Proposed Dam
Charles Brown
480
Edw. Litts
Proposed Waste Water Channel
460
Ira Livingston
460
Gardiner

"It is a well established fact that sewage bacteria, and particularly the pathogenic organisms, die off rapidly in water. The pathogens die for numerous reasons, most important among them being unfavorable and unnatural surroundings, osmosis, an insufficient or unsuitable food supply, and the antagonistic influences of other bacteria and of some forms of animal life. Furthermore, bacteria do not persistently multiply in water, at least not under the climatic conditions of this country. It is a fact that although for a brief period there may be positive indications of bacterial propagation in standing water, this condition rapidly disappears and the bacteria show a rapid and steady diminution and in a few days or weeks may almost entirely disappear. The data already published on this point are abundant. For example, at Lawrence, Mass., the bacterial removal effected in the city reservoir, where the period of storage is about two weeks, amounts to over 93 per cent. At Washington, D. C., where the maximum period of storage is five or six days, the bacterial removal is the same as at Lawrence. In the Boonton Reservoir, where the water supply of Jersey City is impounded, there is storage capacity for over 200 days' supply, and it has been found that during the time the water remains in the reservoir the average bacterial purification effected is 99 per cent.

"The physical improvement in water resulting from storage consists of the subsidence of the fine suspended particles that give the water a turbid appearance and the reduction of color due to substances held in solution. The latter effect is produced in the main by the bleaching effect of the sun.

"The foregoing comments are made in order to show the salutary effect of storage upon the quality of water. There are further important questions to be considered, however, such as the care which should be given to catchment areas above lakes and impounding reservoirs used for domestic purposes, and stagnation of lakes and impounded water, which produces disagreeable tastes and odors in water."

A sample of water was taken from the Alplaus Kill near the site of the proposed reservoir by a representative of the State

Department of Health on April 4th, 1914. The chemical analysis made from this sample shows the water to be very satisfactory for domestic purposes. A complete report of this analysis is given in "Appendix D" hereof.

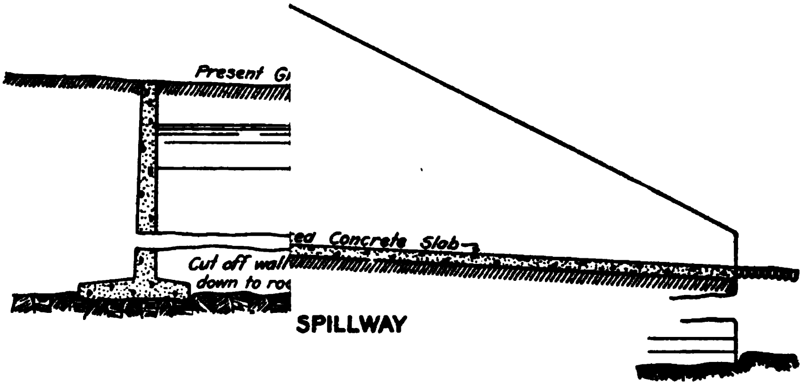
FILTRATION

The water supplies of Troy, Utica, Syracuse, Rochester, and some other gravity supplies with large storage reservoirs, are used without filtration. As these supplies are much of the same nature as the proposed Charlton supply, it is possible that the Alplaus Kill water, after storage, would be suitable, safe and satisfactory without filtration.

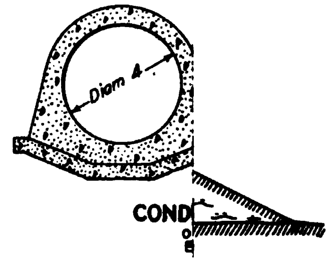
However, the Conservation Law requires that supplies to Union Water Districts shall be by gravity and be filtered. The cost of filtering clear water is small compared to filtering roily water such as is now obtained by Cohoes and Watervliet from the Mohawk river. The cost of chemical treatment of water that is pure, or very nearly so, is much less than in treating such water as that of the Mohawk river. These features of the Charlton supply are very favorable both as to the quality of the water and the cost of filtering. The proposed filtering plant for the Charlton supply is fully set forth hereinafter.

GENERAL DESCRIPTION OF THE DESIGN

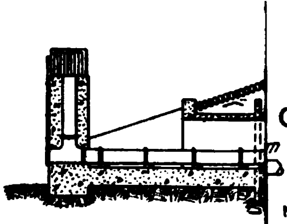
At the site near Charlton it is proposed to build a reservoir dam on the Alplaus Kill with a maximum height of approximately seventy-seven (77) feet. Plate XV shows a map of the reservoir site, the dam, spillway, overflow channel, highways and lands to be taken. A short distance below the proposed site there is an outcropping of rock in the bottom of the creek, and rock also appears in the side hills some little distance above the proposed dam. It is, therefore, intended that the core wall of the dam shall join the ledge rock. It is proposed to build an earth dam with a reinforced concrete core wall (see Plate XVI). This core wall will extend from the rock foundation, or other suitable impervious stratum, to above the flow line of the reservoir. The gate-house (see Plate XVII) is to be of mass concrete with a duplicate set of gates so that one set can be inspected and repaired without interrupting the service. There are also to be two intakes — one 20



SPILLWAY



COND



STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

CHARLTON UNION WATER DISTRICT
SECTIONS OF DAM AND SPILLWAY

MAY 1914

Frank S. Porter ... ASST ENGR

APPROVED A.W. Sherman CHIEF ENGR

feet above the bottom and one 45 feet above the bottom, making it possible to take the water from the level which gives the better quality at any particular time. It is designed to put an automatic water stage register in the gate-house so that a constant record of the fluctuations of the water surface can be kept.

To take care of the flood waters during construction, a reinforced concrete culvert 11 feet in diameter is designed through the dam (see Plates XVI and XVII). This is to carry internal pressure as well as the vertical loading, and would be capable of discharging 500 cubic feet of water per second, which is equal to 200 second feet per square mile, which is believed to be greater than any flood that will ever occur in this watershed.

When the dam is completed the supply main will be laid through the culvert. It is also proposed to install a Venturi meter in the culvert. By comparing the records of this meter with those to be placed at the lower ends of the line to each of the municipalities in the district, it will be possible to determine the amount of leakage, if any, along the line, and promptly stop it.

The spillway is to be placed at the extreme westerly end of the dam, and is designed to carry any flood that can occur without allowing the water to attain a depth greater than two feet on the crest (see Plate XVI).

It will be necessary to excavate an approach channel to the weir and a waste water channel from the weir following the natural contour of the country leading back into the Alplaus Kill, about 3,000 feet below the dam. The material excavated from these channels would be used as a part of the material for the embankment of the dam.

It would be necessary to relocate and construct two sections of highway, as is shown on Plate XV.

The supply main from the Charlton reservoir to the present Cohoes reservoir is to be of 36-inch diameter cast-iron pipe, approximately 19 miles long (for location and profile see Plate XVIII.

The route selected is on the northerly side of the Alplaus Kill, crossing the Schenectady railroad at High Mills road, thence continuing in a southeasterly direction, passing near Grooms Corners, and across the Mohawk river about one mile above Dunsbach

Ferry. After crossing the river, the route follows a ravine due south for nearly one mile, and then takes a northeasterly direction to the Cohoes reservoir.

The supply main is to be carried across the Erie canal on a bridge (or without a bridge if the canal is abandoned before the construction of the pipe line), and is to be carried under the Mohawk river in a tunnel located some 50 feet below the river bed (see Plate XIX). The tunnel is so designed that it will be possible to unwater it at any time and allow an inspection of the pipe line through it, and also to permit of repairs if any should be necessary. Six (6) valves are designed to be placed in the line between Charlton and Cohoes, which will permit the water to be drawn off in comparatively small sections to facilitate repairs when necessary. Blow-off valves are to be placed in the depressions and air valves on the summits.

It is designed to acquire the Cohoes Filter Plant and Reservoid No. 3, and operate them as a part of the proposed Conservation Water Works. It is designed to use Cohoes reservoir No. 3 as a regulating reservoir from which the water would, as at present, be supplied to the filter plant, at which plant water would be filtered to the entire district, that is, for Cohoes, Waterford, Green Island and Watervliet. It is believed that the present filter plant, which is filtering about seven million (7,000,000) gallons per day of Mohawk river water, will be capable of filtering fifteen million (15,000,000) gallons of the clear, comparatively pure, water from the Charlton reservoir.

It is proposed to aerate the water as it passes from the 36-inch supply main from the Charlton reservoir into the Cohoes reservoir No. 3. The aeration process replaces the oxygen which might be lost by long storage, and largely frees the water from objectionable tastes and odors due to minute vegetable or other organisms which sometimes occur in stored water. The aeration will be accomplished by discharging the water into the air through a large number of small nozzles after the manner of fountains.

Cohoes Reservoir No. 3 has a capacity of 60 million gallons, which on the basis of fifteen million (15,000,000) gallons per day (the estimated quantity 20 years hence) would last four days, and afford ample time to make repairs in case of any interruption in the supply pipe from the Charlton Reservoir to said Reservoir No. 3.

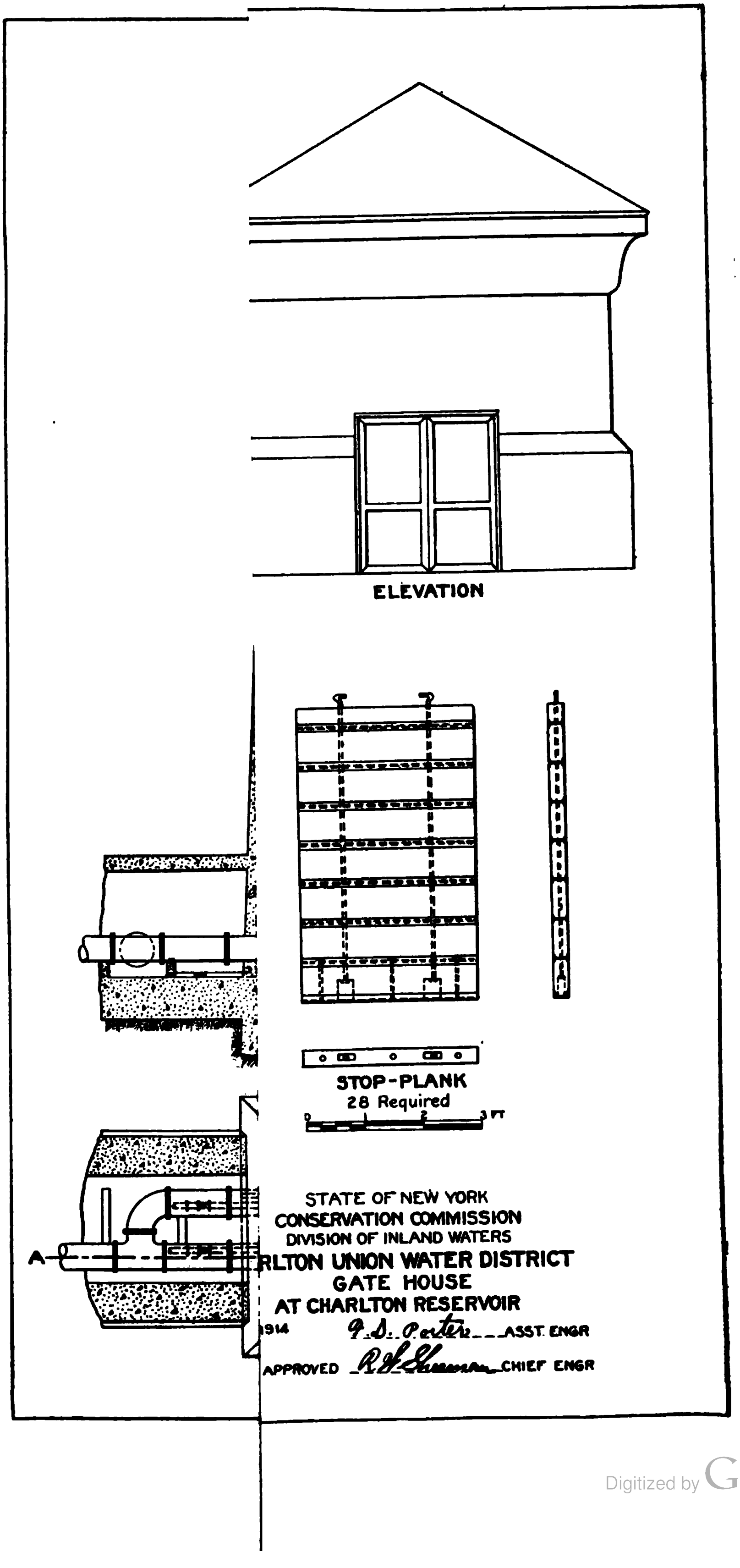
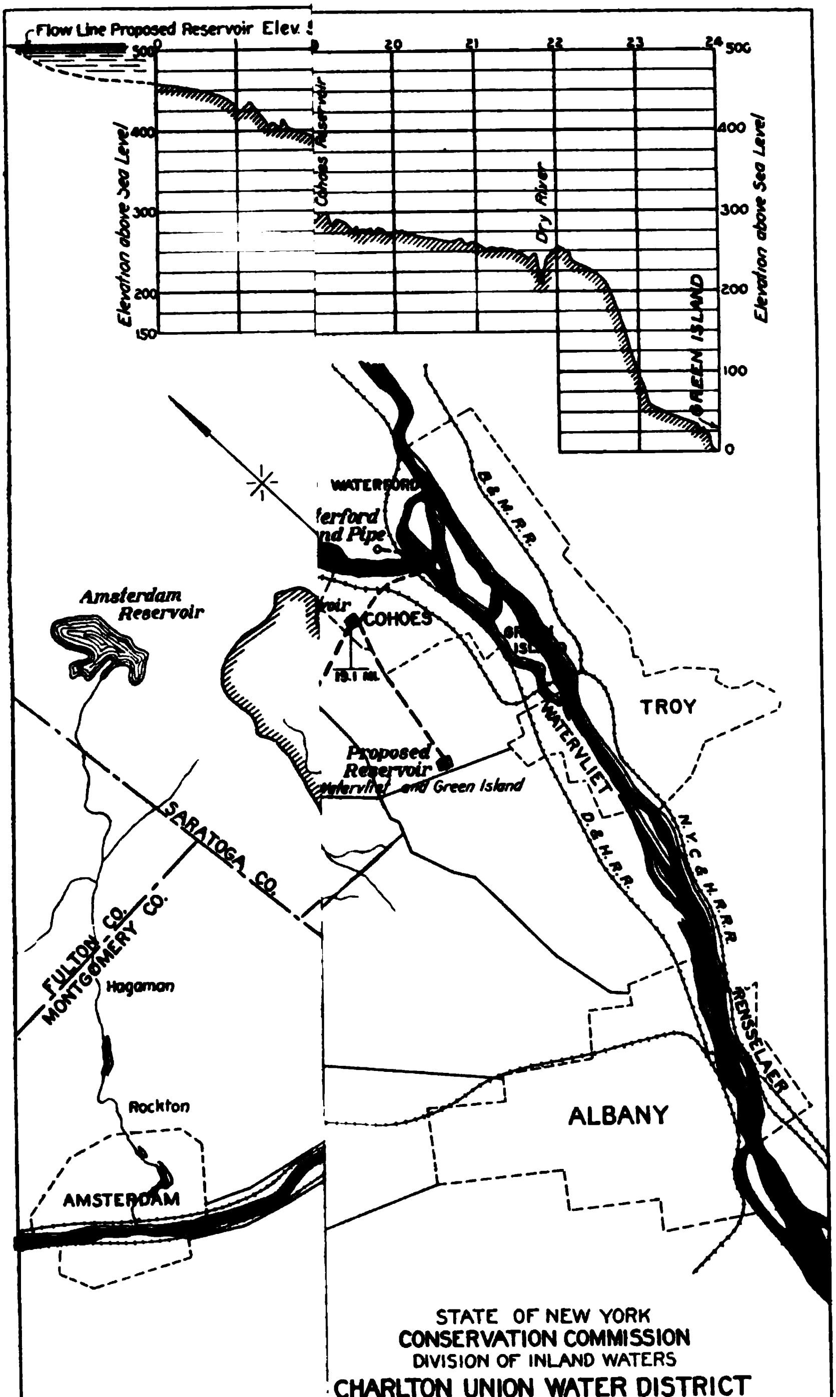

ELEVATION
STOP-PLANK
28 Required
0 1 2 3 FT
A
STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS
RLTON UNION WATER DISTRICT
GATE HOUSE
AT CHARLTON RESERVOIR
1914 G. S. Porter ASST. ENGR
APPROVED CHIEF ENGR

PLATE XVIII



STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS
CHARLTON UNION WATER DISTRICT
LOCALITY MAP

MARCH 1914
ASST. ENGR.
APPROVED CHIEF ENGR.

After being filtered at the Cohoes plant, water will be supplied to Cohoes as at present. Filtered water will be carried by a 12 inch pipe line to the stand-pipe of the Waterford works. A 30 inch main is designed to deliver the combined supply of filtered water from the Cohoes plant to Watervliet and Green Island at the sites of stand-pipes or small covered reservoirs to be constructed and owned by those municipalities, which stand-pipes or reservoirs may have a water surface elevation of 263 feet above tide, thus affording ample head and pressure in the distribution systems. Some statute law enactment may be necessary to authorize the transfer by the City of Cohoes of its Reservoir No. 3 and filter plant, to the Conservation Commission. If there is any serious objection to the proposed use of Reservoir No. 3 and the filter plant, some substitute design can be made, as there is no physical difficulty in constructing a regulating reservoir in lieu of using Cohoes Reservoir No. 3 or another filter plant. The cost of a new regulating reservoir and filter plant would not be more than the estimated value of Cohoes Reservoir No. 3 and filter plant, viz., one hundred and ninety-two thousand dollars ($192,000.00).

DISTRIBUTION SYSTEMS

As under Article 9-A, Section 531, of the Conservation Law, "Union Water Districts," each municipality in the district is to provide stand-pipes or distributing reservoirs at which the Conservation Water Works is to deliver water to each municipality, and as each municipality is also to provide the entire distribution system, and control and sell the water therefrom, designs and estimates of such stand-pipes and reservoirs and distributing systems cannot properly be included in this report, and for that reason are omitted.

ESTIMATED COST OF PROPOSED WATER WORKS

Land to be acquired (1,250 acres).......	$62,500
Clearing and grubbing (112 acres)......	8,000
Stripping dam site (21,300 cubic yards)..	8,500
Rock excavation (150 cubic yards)......	300
Earth excavation (1,700 cubic yards)....	700

Highway relocated (2.4 miles)	$20,400
Earth embankment (396,000 cubic yards)	257,400
Paving (12,100 cubic yards)	24,200
Concrete — Class A (2,820 cubic yards)	39,500
Concrete — Class B (4,000 cubic yards)	32,000
Reinforcing steel (89,690 lbs.)	3,600
Gate-house appurtenances (lump sum)	4,500
36-inch cast-iron pipe (101,000 lin. feet)	720,000
30-inch cast-iron pipe (16,000 lin. feet)	80,000
12-inch cast-iron pipe (11,600 lin. feet)	21,000
Erie canal crossing (lump sum)	2,400
Mohawk river crossing (lump sum)	113,200
Railroad crossings (lump sum)	1,300
Cohoes filter plant (lump sum)	133,000
Cohoes reservoir (lump sum)	59,000
Aeration plant (lump sum)	1,000
	$1,592,500
Add for engineering and contingencies	237,500
Total	$1,830,000

OPERATING EXPENSES, SINKING FUND, AND COST PER MILLION GALLONS

Operating expenses per annum, including filtration	$20,000
Taxes per annum	18,300
Interest on $1,830,000 of bonds at 4½% per annum	82,350
Annual contribution to sinking fund which at 4½% interest would retire bonds in forty years	17,092
	$137,742

$$\frac{\$137,742.00}{\text{15 mil. gal per day x 365 days}} = \$25.16 \text{ per mil. gal.}$$

The cost per million gallons would, of course, be more, while less than fifteen million (15,000,000) gallons were used. After the expiration of the forty year bond period, the annual cost would be reduced to only $38,500 per annum, or to only $2.56 per million gallons.

CONCLUSION

While much in the way of argument in favor of this scheme would, under ordinary conditions, be proper in an engineer's report of this general nature, the provisions of section 531 of Article 9 of the Conservation Law — " Union Water Districts " — make it inadvisable at this time.

The law requires that after the Conservation Commission has made its report to the trustees of the Union Water District, based on the results of its engineering and scientific investigations, surveys, maps, plans, estimate of cost, etc. the Conservation Commission after due public notice, shall hold a public hearing upon the petition and report and hear allegations for and against the scheme, and reach a determination as required by said law.

Therefore, to avoid anything in the nature of prejudgment, your Chief Engineer will not go further than to say that he believes the Alplaus Kill as a source of supply and a Conservation Water Works for the Charlton Union Water District, under the general plan submitted herewith, would be the best and most economical supply obtainable for Cohoes, Watervliet, Green Island and Waterford combined in a Union Water District.

Respectfully submitted
R. W. SHERMAN
Chief Engineer.

The surveys, investigations, design and estimate of cost of the proposed works as set forth in the foregoing report of the Chief Engineer have been carefully made at considerable expense, and this Commission believes them to be reliable. A careful study of them is urged upon the trustees of the Charlton Union Water District and by the governments and people of Cohoes, Waterford, Green Island and Watervliet.

*Article 9-A, Conservation Law, " Union Water Districts," which is included herewith as "Appendix A" for convenience, should also be carefully read and studied in this connection.

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* It has not been deemed necessary to print article 9-A, Conservation Law, in the Annual

A public hearing on this very important subject will be called for an early date by the Conservation Commission as required by Article 9-A of the Conservation Law.

The Conservation Commission will take further action after the close of the hearing.

CONSERVATION COMMISSION
GEORGE E. VAN KENNEN
Chairman
JAMES W. FLEMING
JOHN D. MOORE
Commissioners

CHARLTON REPORT—APPENDIX B

PETITION OF CHARLTON UNION WATER DISTRICT

July 3, 1913

To the Conservation Commission, Albany, N. Y..

GENTLEMEN.— The Charlton Union Water District having organized June 23, 1913, in compliance with the provisions of Chapter 233 of the Laws of 1913, hereby petitions the Conservation Commission under the provisions of section 531 of said law, and sets forth the formation of said Union Water District by attaching hereto as Appendix "A" certified copies of all documents and minutes of all meetings executed and held in the formation of said Union Water District.

The population of said Union Water District, as appears by the United States Census for the year 1910, is as follows:

City of Cohoes	24,709
City of Watervliet	15,074
Town of Waterford	6,128
Village of Green Island	4,737
The total population of said district being	50,648

The petitioner estimates the probable population of each of the municipalities at the end of ten years next succeeding, as follows:

City of Cohoes	26,000
City of Watervliet	20,000
Town of Waterford	7,000
Village of Green Island	5,000

making a total estimated population of said Union Water District of 58,000.

The petitioner estimates the consumption of water per capita per diem which each of said municipalities will require, to be 125 gallons in each, amounting to totals per diem as follows:

City of Cohoes................	3,088,625 gallons
City of Watervliet	1,884,250 gallons
Town of Waterford	766,000 gallons
Village of Green Island	592,125 gallons

The total for said Union Water District being 6,331,000 gallons per diem.

The petitioner further states that the City of Cohoes is the owner of the water works system supplying said city, which is described in detail as follows: See Appendix "B".

That the City of Watervliet is supplied by a corporation known as the Watervliet Hydraulic Company, and that a detailed description of the works of said water works corporation, so far as the same are known to the petitioner at the present time, is as follows: (See Appendix "C".)

That the Town of Waterford is supplied by the Waterford Water Co. Under the provisions of Chapter 391 of the Laws of 1912, the town is authorized to purchase the water works system of the company. The purchase price has been agreed upon. Passing of title is held in abeyance pending the sale by the town of bonds for the purpose of raising funds for the purchase price. A detailed description of said water works is as follows. (See Appendix "D".)

That the Village of Green Island is supplied by a corporation known as Green Island Water Supply Company, and that a description of the water works of said corporation supplying said village is, so far as known to the petitioner, in detail as follows: (See Appendix "E".)

The petitioner further suggests the locations or points in and for each of said municipalities at which each desires to have water supplied by works which may be constructed by the Conservation Commission under the provisions of law aforesaid (Chapter 233 of the Laws of 1913) to be as follows:

> For the City of Cohoes at its present principal distributing reservoir.
>
> For the City of Watervliet at a distributing reservoir to be provided by it at an elevation of not over 300 feet above

tide, to be located within two miles of the westerly boundary of said city.

For the Town of Waterford at the southwesterly standpipe of the existing water works system supplying said town.

For the Village of Green Island a reservoir or standpipe to be provided by said village at an elevation of not over 300 feet above tide, to be located within two miles of the westerly boundary of said village.

The location of present water works of above municipalities is shown in accompanying map. See Appendix " F ".

The petitioner hereby applies to the Conservation Commission to investigate the proposition of a supply of water to said Union Water District under the provisions of said law (chapter 233 of the Laws of 1913), and to cause surveys, maps, plans and estimates to be made, and such further or other information as said Commission may deem advisable; and your petitioner will forever pray, etc.

(Signed) JOHN F. SCOTT
Chairman, Charlton Union Water District

STATE OF NEW YORK, } *ss.:*
COUNTY OF ALBANY, }

On the 3d day of July, in the year 1913, before me personally came John F. Scott, to me known, who, being by me duly sworn, did depose and say, that he resides in the city of Cohoes, county of Albany; that he is the Chairman of the Board of Trustees of the Charlton Union Water District, the municipal corporation described in and which executed the above instrument; that such municipal corporation is not required by law to have a corporate seal; and that he signed his name to said instrument by order of the Board of Trustees of said Union Water District.

JOHN F. SCOTT

Sworn to before me this 3d
day of July, 1913
(Signed) JOHN F. MAHONY
Notary Public

NOTE.— It has not been considered necessary to publish Appendices attached to petition of Charlton Union Water District.

CHARLTON REPORT — APPENDIX C

DISCHARGE IN MILLION GALLONS PER DAY OF ALPLAUS KILL, NEAR CHARLTON, N. Y., FOR 1913 AND 1914

DAY	1913							1914				
	June	July	August	September	October	November	December	January	February	March	April	May
1	11.9	4.2	T	.039	.211	1.775	17.600	3.540	31.000	3.170	193.200	43.3
2	35.2	3.7	T	.019	.591	.724	19.880	2.030	30.100	8.600	296.000	30.4
3	17.6	3.7	T	.007	1.425	.679	14.780	3.380	36.800	9.500	133.000	23.2
4	12.9	3.5	T	.001	.633	2.610	11.620	2.410	26.490	10.520	102.800	19.4
5	10.2	7.0	T	T	.297	.904	9.040	3.610	26.490	13.500	99.500	44.5
6	9.7	4.6	T	T	.267	2.413	6.920	2.350	22.200	8.600	92.500	53.5
7	11.6	3.7	T	T	.329	1.214	13.510	3.460	*18.130	7.680	69.800	26.5
8	11.8	3.2	T	T	.238	1.660	29.200	4.310	*14.070	7.680	192.000	20.0
9	9.4	3.0	T	T	.398	27.400	11.620	2.328	10.000	6.910	179.500	18.1
10	8.0	2.6	T	T	.633	42.820	11.620	4.150	*9.260	7.680	108.500	16.8
11	8.0	2.6	T	T	.186	17.640	*11.720	3.995	*8.510	9.040	93.100	14.2
12	7.2	2.5	T	T	.096	12.200	*11.810	4.620	*7.770	5.480	130.500	20.0
13	6.46	2.3	T	T	.162	9.050	*11.910	*4.090	*7.030	4.780	83.400	103.0
14	5.8	1.9	.050	T	.211	11.050	*12.010	*3.550	*6.280	5.810	68.400	38.7
15	5.3	1.9	.001	T	.297	10.520	*12.100	*3.020	*5.540	4.860	69.600	23.3
16	5.3	1.6	T	T	.472	9.500	12.200	*2.490	*4.800	9.040	97.000	16.8
17	4.5	1.6	T	T	.211	7.300	11.620	*1.960	*4.060	21.410	92.500	14.2
18	4.5	1.8	T	T	.079	4.780	10.000	1.426	3.310	65.200	68.500	12.3
19	4.3	1.5	T	T	.074	4.620	4.225	1.375	*3.250	34.900	64.000	11.6
20	5.5	3.6	T	T	.071	35.800	3.315	1.426	*3.190	37.800	63.300	10.3
21	7.0	2.1	T	T	.071	19.100	3.170	1.660	*3.130	31.000	133.000	9.7
22	6.1	1.1	T	.140	.071	14.143	4.150	2.350	*3.080	23.900	58.100	8.4
23	4.9	1.0	T	1.215	2.670	12.200	2.220	1.835	*3.010	20.700	36.800	7.7
24	4.4	1.3	T	.769	1.102	10.000	2.960	1.899	2.960	16.200	29.700	6.5
25	4.4	1.5	T	.510	1.895	9.050	3.380	2.540	2.815	15.500	25.800	6.1
26	4.2	.9	T	.238	7.300	5.160	4.070	2.880	2.740	52.500	119.000	7.1
27	11.0	.8	T	.329	14.050	5.480	2.350	4.460	2.880	210.000	77.500	6.5
28	8.0	.8	T	.267	6.125	3.690	4.150	6.920	2.960	504.000	152.000	4.1
29	5.6	.6	T	.211	4.150	3.380	5.810	10.530	....	264.000	87.200	2.7
30	4.9	.3	.029	.238	4.150	6.910	8.140	15.490	....	191.700	104.000	3.6
31	....	T	.091	....	2.605	....	4.300	21.450	....	217.000	....	2.6
Total	255.7	70.9	.171	3.983	51.070	293.772	291.400	131.534	301.855	1,828.660	3,120.200	625.1

T = Trace. * Interpolated.

CHARLTON REPORT — APPENDIX D

HERMANN M. BIGGS, M.D.
Commissioner

DIVISION OF LABORATORIES AND RESEARCH
AUGUSTUS WADSWORTH, M.D.
Director

NEW YORK
STATE DEPARTMENT OF HEALTH
ALBANY

SANITARY ANALYSIS OF WATER

(RESULTS ARE PARTS IN 1,000,000)

No. B-12253, C-8828, April 15, 1914

From Town of Charlton, County of Saratoga.

Collection of sample authorized by Hermann M. Biggs.
Collected and sealed by C. A. Howland.
Collected on April 4, 1914, 11:55 A. M.
Collected from Alplaus Kill at a point about 125 feet above gauging station maintained by U. S. Geological Survey near Charlton.

Color	18.	Nitrogen as	Ammonia free	.018	Hardness, total	40.3
Odor, hot	1 Veg.		Ammonia albuminoid total	.138	Alkalinity	32.00
Odor, cold	1 Veg.					
Turbidity	10.					
Solids, total	88.		Nitrites	.001	Iron	
Loss on ignition	23.		Nitrates	0.40	Bacteria per c.cm.	800
Mineral residue	65.					
		Ogygen consumed		6.50		
		Chlorine		0.75		

Remarks:

B. coli type.

10 c. c. inoculations 1 plus 2 minus.
1 c. c. inoculations 0 plus 3 minus.
1–10 c. c. inoculations 0 plus 3 minus.

(Signed) A. WADSWORTH

VI. INSPECTION AND SUPERVISION OF HYDRAULIC STRUCTURES

STRUCTURES FOR IMPOUNDING WATER

Jurisdiction of this subject is conferred upon the Conservation Commission by section 22 of article 3 of the Conservation Law, as amended by chapter 736 of the Laws of 1913. Under this statute, before any new dam may be built or any existing dam reconstructed, plans and specifications therefor shall be submitted to and approved by the Conservation Commission. Penalties for violation of the law are prescribed. Authority is given the Commission to order the repair, alteration or reconstruction of existing dams, if, in its judgment, such action is necessary. The only dams not under the jurisdiction of the Commission are those forming a part of the canal system of the State and those small structures " Where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons."

The obvious purpose of the law is to ensure the stability, permanency and safety of all dams, to the end that they may be made secure against failure, and danger to life and property along the streams below be eliminated.

APPROVAL OF PLANS AND SPECIFICATIONS OF DAMS

The past year has been one of marked activity in the construction of dams. Plans and specifications for the construction or reconstruction of fifty such structures have been approved by resolution of the Commission. In a number of instances, before approval was granted, the Commission has required changes in the plans and specifications submitted. Realizing that such changes were solely in the interest of good and safe construction, the owners of dams to be constructed or to be reconstructed or repaired, have cheerfully complied with the requirements of the Commission, and have shown a commendable willingness to cooperate with the efforts of the Commission to make their dams entirely secure. The value of supervision by the Commission and its readiness to assist designers, owners and builders of dams is evidently appreciated not alone by owners of dams but also by the general public whose welfare and safety are thereby enhanced.

The dams for which plans and specifications have been approved, with the date of approval, serial and location numbers, name of watershed, name of locality, name of owner and purpose of construction are given on page 29.

During the fiscal year improvements to twenty-four dams by means of repairs, changes and additions thereto have been required by the Commission. A list of such dams with the location, number and name of the watershed, the location and the name of the owner for each is as follows:

Location No.	Name of watershed	Location	Owner
229	Black river	Carthage	Whaling & Gormley
229	Black river	Carthage	Carthage Machine Co.
563	Lake Champlain	Elizabethtown	Lobdell Bros.
568	Lake Champlain	Elizabethtown	Elizabethtown Electric Plant
738	Lake Champlain	Crown Point Center	Glens Falls Trust Co
408	Lower Hudson river	Monroe	Geo. R. Conklin Est.
410	Lower Hudson river	Harriman	Ward Brower
420	Lower Hudson river	Harriman	E. H. Harriman Est.
425	Lower Hudson river	Chester	G. F. Roesch
429	Lower Hudson river	Chester	Mrs. C. I. Bull
430	Lower Hudson river	Monroe	Geo. R. Conklin Est.
432	Lower Hudson river	Monroe	R. W. Smith
443	Lower Hudson river	Monroe	F. F. Proctor
509	Lower Hudson river	Vail Gate	D. P. Beach
592	Lower Hudson river	Walden	Wallkill River Co.
593	Lower Hudson river	Walden	Walden Knife Co.
1000	Lower Hudson river	Shandaken	Ada Van Zandt
1164	Lower Hudson river	Chatham	Chatham Electric Light Co.
1374	Lower Hudson river	South Troy	Garrit W. Vandenburgh
278	Mohawk river	Amsterdam	Wm. S. Phillips
572	Mohawk river	Poland	E. L. Coon
368	Oswego river	Minoa	Frank N. Kyser
236	E. St. Lawrence river	Chateaugay	Dock & Coal Co.
998	Susquehanna river	E. Worcester	Great Bear Light, Heat & Power Co.

During the fiscal year only five dams have failed as compared with seventeen in 1913 and twenty-two in 1912. As soon as practicable each dam was examined in order to ascertain the underlying cause of each failure and to obtain first-hand information which would assist us to avert similar casualties hereafter.

Following is a list and description of the five dams which failed during the fiscal year, with location number, the name of the watershed, name of the stream, locality in which situated, name of owner and date of failure.

Dam No. 385, Upper Hudson river watershed, at Luzerne, owned by Fred Dingman. The flume and spillway carried out April 17, 1914, because of rotted timber. In August, 1913, the Commission wrote the owner that the dam was in poor condition and should be fixed.

Dam No. 278, Mohawk river watershed, at Amsterdam, owned by William S. Phillips. Failed several times on account of poor construction of spillway. At the time of construction this dam was not within the jurisdiction of this Commission.

Dam No. 638, Oswego river watershed, at Taughannock Falls, owned by Ovid Electric Light Company. A curved plank dam built in 1902, 120 feet long, 12 inches thick and 7 feet greatest height, anchored back every 8 feet on top by wooden ties. Failed January 29, 1914, on account of not being strong enough to withstand ice flow.

Dam No. 300, Raquette river watershed, at Hannawa Falls, owned by Hannawa Falls Water Power Company of Potsdam. A solid masonry dam faced with Potsdam sandstone, built in 1899. The downstream facing was carried away March 1, 1914.

Dam No. 61, St. Regis river watershed, at Helena. A concrete dam failed because unfinished at time of high flood March, 1914.

CENSUS AND INSPECTION OF DAMS

It is the purpose of the Commission to inspect and record the location and characteristics of every dam in the State. For this purpose a printed form of report has been provided, to collect the data necessary for the calculation of the stability of each dam and for a determination of its condition. Copies of these blanks are furnished to the game protectors and forest rangers, who have been of great assistance. So far as our funds have allowed, assistants have been placed in the field during the summer months, in order to systematically list the dams of each county. During the summer of 1914 these assistants were required to furnish a motorcycle and accomplished twice the amount of work performed in either of the preceding summers when liveries were employed at about same expense. These reports, when returned, are carefully examined and steps taken to cause the owner to correct any defect or weakness and to bring them up to an approved standard. Where it is considered advisable, a special examination is made by the inspector of docks and dams. The reports are systematically arranged, filed, catalogued and indexed.

APPENDIX A

DECISIONS OF THE COMMISSIONS ON WATER SUPPLY APPLICATIONS

APPENDIX A

DECISIONS OF THE COMMISSIONS ON WATER SUPPLY APPLICATIONS

The following table contains a list of the applications filed with this Commission and the State Water Supply Commission since the creation of the latter, together with the dispositions made of each case:

No.	Applicant	Date of filing	Disposition
1.	City of New York	Nov. 3, 1905	Approved May 14, 1906
2.	City of Kingston	Nov. 8, 1905	Discontinued
3.	City of Oneida	Dec. 2, 1905	Approved Mar. 16, 1906
4.	Village of Lyons Falls	Dec. 26, 1905	Approved Mar. 28, 1906
5.	Village of Constableville	Dec. 30, 1905	Approved April 19, 1906
6.	City of Watervliet	Jan. 25, 1906	Dismissed Sept. 25, 1906
7.	Village of Millbrook	Feb. 21, 1906	Withdrawn Mar. 5, 1906
8.	Village of White Plains	April 20, 1906	Approved June 15, 1906
9.	City of Lockport	May 24, 1906	Approved July 13, 1906
10.	Village of Malone	June 28, 1906	Approved Jan. 18, 1907
11.	Village of Holland Patent	Aug. 25, 1906	Approved Sept. 25, 1906
12.	Village of Brewster	Oct. 12, 1906	Approved Feb. 21, 1907
13.	Village of Bergen	Oct. 18, 1906	Approved Nov. 8, 1906
14.	City of Gloversville	Nov. 27, 1906	Approved Jan. 18, 1907
15.	Village of Carthage	Dec. 13, 1906	Approved Mar. 14, 1907
16.	Hannacroix Water Co.	Dec. 22, 1906	Approved Oct. 17, 1907
17.	City of Plattsburg	Jan. 19, 1907	Approved Feb. 27, 1907
18.	Village of Pleasantville	Feb. 9, 1907	Approved Aug. 6, 1907
19.	Village of Seneca Falls	Feb. 21, 1907	Approved Oct. 16, 1907
20.	Village of Waterville	Mar. 6, 1907	Approved May 9, 1907
21.	Village of Old Forge	Mar. 13, 1907	Approved May 9, 1907
22.	Village of Ossining	Mar. 13, 1907	Approved Nov. 26, 1907
23.	Village of Peekskill	Mar. 15, 1907	Discontinued
24.	Urban Water Supply Co.	May 22, 1907	Approved July 16, 1907
25.	Village of East Aurora	June 13, 1907	Approved July 18, 1907
26.	Martinsburg Water District	July 2, 1907	Approved July 15, 1907
27.	City of New York — Modification of Catskill Aqueduct line	July 12, 1907	Approved Oct. 15, 1907
28.	City of New York — Schoharie watershed	July 12, 1907	Discontinued
29.	City of Rome	July 20, 1907	Approved Aug. 15, 1907
30.	Tannersville Water Co.	Aug. 23, 1907	Approved Dec. 21, 1907
31.	Great South Bay Water Co.	Dec. 14, 1907	Approved Jan. 21, 1908
32.	City of Gloversville (second application)	Jan. 16, 1908	Approved Feb. 18, 1908
33.	Village of McGrawville	Jan. 20, 1908	Approved Mar. 11, 1908
34.	Village of Malone	Feb. 12, 1908	Discontinued
35.	Village of Bainbridge	Feb. 20, 1908	Discontinued

No.	Applicant	Date of filing	Disposition
36.	Staatsburg Water Co	Mar. 6, 1908	Approved April 10, 1908
37.	Village of Briarcliff Manor	April 18, 1908	Discontinued
38.	Palenville Water District	July 16, 1908	Petition not completed.
39.	Harmon Water Co	April 27, 1908	Withdrawn Sept. 16, 1908
40.	City of New York — Suffolk county sources	July 29, 1908	Withdrawn Nov. 26, 1913
41.	Village of East Syracuse	July 30, 1908	Approved Aug. 14, 1908
42.	Edmeston Water Co	Aug. 14, 1908	Approved Sept. 16, 1908
43.	Village of Marcellus	Aug. 24, 1908	Approved Sept. 30, 1908
44.	Village of Shortsville	Oct. 5, 1908	Approved Feb. 6, 1909
45.	Village of Clifton Springs	Oct. 5, 1908	Approved Oct. 14, 1908
46.	Village of Webster	Nov. 23, 1908	Approved Dec. 12, 1908
47.	Syracuse Suburban Water Co	Dec. 1, 1908	Approved April 9, 1909
48.	Village of White Plains (second application)	Dec. 30, 1908	Approved Nov. 30, 1909
49.	City of Glens Falls	Mar. 6, 1909	Approved April 21, 1909
50.	City of New York — Nassau county sources	Mar. 12, 1909	Approved May 15, 1909
51.	Village of Bainbridge (second application)	Mar. 16, 1909	Approved Aug. 18, 1909
52.	Fultonville Water Co	Mar. 17, 1909	Combined with No. 57
53.	Village of West Carthage	April 7, 1909	Approved April 22, 1909
54.	Rensselaer Water Co	April 12, 1909	Approved April 21, 1909
55.	City of Niagara Falls	April 20, 1909	Approved July 14, 1909
56.	Village of Webster (amended application)	May 5, 1909	Approved June 15, 1909
57.	Village of Canajoharie	June 1, 1909	Approved Mar. 10, 1910
58.	Village of Croghan	June 17, 1909	Approved Sept. 22, 1909
59.	Village of Mechanicville	June 22, 1909	Approved July 13, 1909
60.	Central Bridge Water Co	July 2, 1909	Approved July 29, 1909
61.	Whitney's Point Water Co	July 8, 1909	Approved July 30, 1909
62.	Water District of Town of Petersburg	July 15, 1909	Approved Oct. 14, 1909
63.	Village of Livonia	July 16, 1909	Approved Oct. 21, 1909
64.	Village of Mt. Morris	Aug. 2, 1909	Discontinued.
65.	Village of Painted Post	Aug. 18, 1909	Approved Sept. 3, 1909
66.	Village of Farmingdale	Sept. 22, 1909	Discontinued.
67.	City of New York — Modification of Catskill Aqueduct	Dec. 16, 1909	Approved Oct. 7, 1910
68.	Village of Barker	Jan. 11, 1910	Discontinued
69.	Jamaica Water Supply Co	Jan. 13, 1910	Approved Feb. 15, 1910
70.	Village of Pike	Feb. 3, 1910	Approved Mar. 10, 1910
71.	Village of Keeseville	Mar. 4, 1910	Approved May 25, 1910
72.	Otisville Water District	April 4, 1910	Approved Nov. 30, 1910
73.	Village of Spencerport	Mar. 23, 1910	Approved May 10, 1910
74.	City of Plattsburg	Mar. 24, 1910	Denied May 20, 1910
75.	Village of Croton-on-Hudson	April 6, 1910	Approved Aug. 24, 1910
76.	Harrison Water District No. 1	April 18, 1910	Approved May 20, 1910
77.	Greenwich Union Water Works Co.	April 29, 1910	Approved May 11, 1910
78.	Village of Black River	May 3, 1910	Approved May 20, 1910

No.	Applicant	Date of filing	Disposition
79.	Belfast Water District..........	May 26, 1910	Approved July 7, 1910
80.	Village of Moravia.............	July 6, 1910	Approved Aug. 24, 1910
81.	Village of Canajoharie..........	July 13, 1910	Approved Aug. 10, 1910
82.	Village of Youngstown..........	July 20, 1910	Approved Aug. 24, 1910
83.	City of Hornell................	Aug. 4, 1910	Approved Aug. 24, 1910
84.	Village of Silver Springs.........	Aug. 12, 1910	Approved Oct. 7, 1910
85.	City of Ithaca.................	Aug. 22, 1910	Approved Nov. 3, 1910
86.	Roslyn Water District..........	Aug. 17, 1910	Approved Oct. 25, 1910
87.	Village of Cherry Creek.........	Sept. 6, 1910	Approved Oct. 7, 1910
88.	Andes Water Co..............	Sept. 12, 1910	Approved Oct. 7, 1910
89.	Village of Oriskany Falls........	Oct. 11, 1910	Approved Nov. 3, 1910
90.	Summerville Water District.....	Oct. 20, 1910	Withdrawn Oct. 28, 1910
91.	John A. Drew.................	Oct. 28, 1910	Approved Dec. 29, 1910
92.	Village of Angola..............	Dec. 7, 1910	Approved Dec. 29, 1910
93.	Village of Avoca...............	Jan. 25, 1911	Approved Feb. 10, 1911
94.	Westbury Water District........	Feb. 21, 1911	Approved April 7, 1911
95.	Weedsport Water Co............	Mar. 1, 1911	Approved Mar. 22, 1911
96.	City of Gloversville.............	April 26, 1911	Approved June 16, 1911
97.	Village of Cornwall.............	May 24, 1911	Approved June 6, 1911
98.	City of Cortland...............	June 17, 1911	Approved July 11, 1911
99.	Castle Heights Water Co........	July 6, 1911	Approved Sept. 25, 1911
100.	Village of Mexico..............	Aug. 12, 1911	Denied April 15, 1912
101.	New York City — Borough of Richmond..................	Sept. 12, 1911	Approved June 3, 1912
102.	New York City — Borough of Brooklyn..................	Sept. 12, 1911	Discontin'd April 29, 1912
103.	Manhasset — Lakeville Water District.....................	Oct. 24, 1911	Approved Dec. 20, 1911
104.	Village of Argyle...............	Dec. 9, 1911	Approved Feb. 28, 1912
105.	Staatsburg Water Co...........	Dec. 11, 1911	Approved Jan. 25, 1912
106.	Village of Albion...............	Jan. 31, 1912	Approved Dec. 3, 1912
107.	East Williston Water District....	Feb. 16, 1912	Approved April 30, 1912
108.	Village of Middleport...........	Feb. 19, 1912	Approved April 15, 1912
109.	Baldwin Water Co.............	Mar. 29, 1912	Approved May 6, 1912
110.	New York City — Schoharie Watershed..................	April 2, 1912	Denied April 23, 1913
111.	Village of Grandview...........	April 3, 1912	Approved May 27, 1912
112.	Village of Piermont.............	April 19, 1912	Approved May 27, 1912
113.	Hartsdale Water District........	April 15, 1912	Approved June 4, 1912
114.	Village of Wolcott.............	April 22, 1912	Approved June 4, 1912
115.	Spring Valley Water Works & Supply Co..................	April 27, 1912	Approved May 27, 1912
116.	Village of Mt. Morris...........	May 10, 1912	Approved Dec. 7, 1912
117.	Village of Peekskill.............	May 14, 1912	Approved July 31, 1912
118.	Village of Fayetteville...........	May 27, 1912	Approved July 31, 1912
119.	Village of Port Leyden..........	June 7, 1912	Approved Sept. 10, 1912
120.	Rochester & Lake Ontario Water Co........................	June 14, 1912	Approved July 31, 1912
121.	Village of Briarcliff Manor......	June 22, 1912	Incomplete

o.	Applicant	Date of filing	Disposition	
122.	Sodus Water District	July 9, 1912	Approved	Sept. 10, 1912
123.	Village of LaSalle	July 9, 1912	Approved	July 31, 1912
124.	City of Cortland	June 22, 1912	Approved	July 31, 1912
125.	Village of Brockport	July 23, 1912	Approved	Dec. 7, 1912
126.	Locke Water District No. 1	July 27, 1912	Approved	Sept. 24, 1912
127.	Madrid Water District	Aug. 31, 1912	Denied	May 16, 1914
128.	Albion Water Works Co	Sept. 11, 1912	Approved	April 21, 1913
129.	North End Water District — Town of Scarsdale	Sept. 16, 1912	Approved	Nov. 15, 1912
130.	New Castle Water Co	Sept. 23, 1912	Approved	June 10, 1913
131.	Village of West Winfield	Oct. 24, 1912	Approved	Dec. 30, 1912
132.	Upper Jay Water District	Dec. 2, 1912	Approved	Dec. 30, 1912
133.	City of Geneva	Mar. 7, 1913	Approved	June 10, 1913
134.	Village of Honeoye Falls	Dec. 19, 1912	Approved	Feb. 24, 1913
135.	Village of Mexico	Jan. 9, 1913	Approved	April 7, 1913
136.	Marion Water District	Mar. 31, 1913	Approved	June 10, 1913
137.	Wellsville Water Co	April 4, 1913	Approved	July 8, 1913
138.	Greenwich Union Water Co	April 23, 1913	Approved	Sept. 10, 1913
139.	Village of Madison	May 7, 1913	Approved	June 30, 1913
140.	City of Plattsburg	May 13, 1913	Approved	July 8, 1913
141.	Village of Frankfort	June 3, 1913	Approved	Sept. 10, 1913
142.	Village of Bloomingdale	June 24, 1913	Pending	
143.	Village of Clinton	June 24, 1913	Approved	Sept. 10, 1913
144.	City of Yonkers	July 11, 1913	Approved	Nov. 7, 1913
145.	Waterloo Water Co	July 29, 1913	Approved	Sept. 19, 1913
146.	City of Fulton	July 15, 1913	Approved	Sept. 19, 1913
147.	Village of Lisle	Sept. 23, 1913	Pending	
148.	Hamlin Water District	Nov. 6, 1913	Approved	Mar. 19, 1914
149.	Sylvan Spring Water Co	Nov. 6, 1913	Approved	Jan. 13, 1914
150.	Williamson Water District	Dec. 4, 1913	Approved	Dec. 31, 1913
151.	Clover Street Water District	Jan. 7, 1914	Approved	Jan. 29, 1914
152.	City of Mount Vernon	Jan. 8, 1914	Pending	
153.	Village of Sidney	Jan. 30, 1914	Pending	
154.	Village of Centerville Station	Feb. 6, 1914	Approved	May 18, 1914
155	Village of Franklin	Feb. 13, 1914	Approved	May 18, 1914
156.	Village of Franklinville	Feb. 16, 1914	Approved	May 18, 1914
157	Village of Morris	Feb. 24, 1914	Approved	April 1, 1914
158.	Village of Arkport	Mar. 11, 1914	Approved	May 18, 1914
159.	Sea Breeze Water District	April 6, 1914	Approved	May 19, 1914
160.	Village of Albion (second application)	April 28, 1914	Approved	June 11, 1914
161.	Village of East Syracuse	May 7, 1914	Approved	June 4, 1914
162.	Village of New Paltz	May 20, 1914	Approved	June 5, 1914
163.	Monroe Avenue Water District	May 20, 1914	Approved	June 11, 1914
164.	City of Watervliet	May 25, 1914	Pending	
165.	Riverhead Water District	June 2, 1914	Approved	Sept. 8, 1914
166.	New York City — Schoharie Sources	June 2, 1914	Pending	
167.	Village of Lyons	June 8, 1914	Approved	Aug. 20, 1914
168.	Varysburg Water Co. Inc	June 27, 1914	Approved	Sept. 8, 1914

No.	Applicant	Date of filing	Disposition
169.	Village of Naples	July 6, 1914	Pending
170.	Village of Wappingers Falls	July 21, 1914	Pending
171.	Village of Palmyra	Aug. 1, 1914	Approved Sept. 30, 1914
172.	Village of St. Johnsville	Aug. 14, 1914	Pending
173.	Town of Greece — Ridge Road Water District	Aug. 22, 1914	Approved Sept. 29, 1914
174.	Village of Port Henry	Sept. 17, 1914	Pending

PERMITS TO OPERATE ISSUED OCTOBER 1, 1913, TO SEPTEMBER 30, 1914

The following completed structures and water supply systems, applications for which have been approved, have been approved as to safety and permits to operate the same issued:

No.	Applicant	Application approved	Permit to operate
109.	Baldwin Water Co	May 6, 1912	Oct. 13, 1913
119.	Village of Port Leyden	Sept. 10, 1912	Nov. 25, 1913
122.	Sodus Water District	Sept. 10, 1912	Dec. 16, 1913
125.	Village of Brockport (temporary)	Dec. 7, 1912	May 19, 1914
131.	Village of West Winfield	Dec. 30, 1912	Sept. 9, 1914
135.	Village of Mexico (partial)	April 7, 1913	April 17, 1914
136.	Marion Water District	June 10, 1913	Sept. 25, 1914
138.	Greenwich Union Water Works Co	Sept. 10, 1913	Sept. 9, 1914

WATER SUPPLY APPLICATION NO. 40

STATE OF NEW YORK — CONSERVATION COMMISSION

CITY OF NEW YORK — SUFFOLK COUNTY SOURCES.

Petition filed July 29, 1908.

Hearing held September 10, 1908, and adjourned from time to time thereafter to May 26, 1913, and October 1, 1913.

Petition asked for approval of plan of obtaining an additional water supply for the city of New York by the sinking of many driven wells in Suffolk county and pumping water therefrom to the boroughs of Brooklyn and Queens.

The city asked permission to withdraw this application and this withdrawal was authorized by resolution of the Conservation Commission November 26, 1913.

WATER SUPPLY APPLICATION NO. 125

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application of the VILLAGE OF BROCKPORT, Monroe county, N. Y., for the approval of its proposed source of water supply, maps, etc.	*Third supplemental decision*

Third supplemental application filed May 4, 1914.

Decision May 18, 1914.

Approved.

Alfred M. White, Chairman of the Board of Water Commissioners of the village of Brockport, acting for said board and village, on May 2, 1914, made application to the Conservation Commission for its approval of certain modifications in the plans of that village for the acquisition of a source of water supply and the installation of a water supply system. This application was filed in the office of the Conservation Commission May 4, 1914.

On August 23, 1912, the village of Brockport filed with the Conservation Commission an application for approval of the project of that village for the use of Lake Ontario as a source of water supply and the installation of a complete water supply system in that village. This application was approved with certain modifications and conditions on December 7, 1912. On December 26, 1912, the village made a supplemental application to the Conservation Commission, asking for approval of certain modifications in the plans already approved. Some of these modifications had been made to meet conditions already imposed and others, notably a change in the type of filter to be used, were desired, in order that the system might be completed within the limits of the appropriation. This supplemental application was approved with certain conditions March 25, 1913. On April 3, 1913, the village made a second supplemental application, asking for approval of certain changes in the materials to be used in the system. This supplemental application was denied April 8, 1913.

On January 10, 1913, the board of trustees received sealed bids for an issue of water bonds to the amount of $275,000 and thereafter, on January 10, 1913, these bonds were sold to the lowest bidder therefor. On January 29, 1913, contracts for the construction of the work were duly awarded to Frank George & Company, R. D. Wood & Company and J. Victor Johnson Company. Thereafter said J. Victor Johnson Company refused to sign the contract awarded to it and such contract was awarded to Frank George & Company. Subsequently, with the consent of the board of trustees of the village, said Frank George & Company assigned portions of their contracts to John H. McGowan Company and the New York Continental Jewell Filtration Company.

On March 13, 1913, at a special election duly held for that purpose, a proposition authorizing the board of trustees to purchase that portion of the distribution system of the Brockport-Holley Water Company within the village limits, the standpipe and connecting main south of the village in the town of Sweden and the main extending northerly from the village in the towns of Sweden and Clarkson, was carried in the affirmative. Thereafter on the 1st day of June, 1913, the village of Brockport purchased this portion of the system of the Brockport-Holley Water Company and took possession thereof. The location of the various pipes and structures thus acquired by the village are shown upon a map filed in the office of this Commission and bearing accession number 4036. Thereafter the water supply system of the village was built as approved, except that: the distribution piping in the village streets was omitted as such pipes had been purchased; the force main connecting the distribution reservoir with the village was omitted between the village and the standpipe, the existing 10-inch main being substituted in lieu thereof; and that portion of the proposed force main between the standpipe and the distribution reservoir was constructed of 12-inch cast-iron pipe instead of 14-inch pipe as originally proposed.

In order to obtain franchises for the laying of the force main in the towns of Hamlin, Clarkson and Sweden, the village was obliged to undertake to furnish water to such of the inhabitants of each of said towns as reside on the highways in which this main is laid and not within any water district. This water is to be furnished for domestic use, sanitary purposes and for fire protection, the rates to be charged therefor not to exceed those charged to private customers in the village of Brockport.

Persons residing in the town of Clarkson on the north side of West avenue, on the north side of East avenue and along the lake road were formerly provided with water by the Brockport-Holley Water Company through the system which was purchased by the village of Brockport. The mains used for supplying these persons were included in the system purchased by the village and therefore these persons can be provided with water only from the village.

Therefore, the village of Brockport through its board of water commissioners makes application for the following:

1. Approval of the substitution of the distribution system purchased by the village from the Brockport-Holley Water Company in place and stead of the new distribution system provided for by the plans and specifications heretofore approved by the Commission.

2. Approval of the substitution of the 10-inch main leading south from the distribution system to the standpipe for the 14-inch main provided for by the said original plans. Said 10-inch main having been acquired in said purchase from the Brockport-Holley Water Company.

3. Approval of the substitution of a 12-inch main leading from the said standpipe south to the reservoir in place of a 14-inch main as provided for by said original plans.

4. Authority to furnish the inhabitants of the towns of Hamlin, Clarkson and Sweden, residing on the highways in which the mains of said water system are laid, not within any water district duly organized, with water for domestic use, sanitary purposes and fire protection.

5. Authority to furnish the inhabitants of Clarkson, residing along the lines of the mains purchased by the said village from the Brockport-Holley Water Company, with water for domestic use, sanitary purposes and fire protection.

6. Approval of the changes in the distribution system on Main street between Market street and State street, as shown upon said map, accession number 4036.

7. Permit to operate the said waterworks system pending the final completion, inspection and acceptance of the same, for the purpose of supplying the residents of Brockport and Clarkson with water for the purposes above stated.

It appears that the distribution system of the Brockport-Holley Water Company, which has been acquired by the village, is of satisfactory design and in condition sufficiently good to permit of its being utilized for the purposes which would have been served by the new system originally approved. As said company had for years been unable to furnish the inhabitants of Holley, Brockport and Clarkson with water sufficient for their needs, the separation from the system of these two last named places will materially benefit the water supply situation in the village of Holley. The changes in the force main through the village of Brockport and south thereof were such as to be adequate to connect this required system with the proposed source of supply. The reduction in the size of the main south of the village will tend to increase the operative cost of the system and to decrease in some measure the value of the fire protection, but this change is not serious.

The new water supply system of this village has such capacity that it can readily supply those persons in the towns of Sweden, Clarkson and Hamlin as may desire to use this water.

This Commission has already, on March 19, 1914, approved the application of the commissioners of the water district of the town of Hamlin to take water from the Brockport waterworks system.

This Commission has already determined that the quality of the water supplied to the piping system of the village of Brockport will be satisfactory for domestic use.

The matter of permission to operate these works has been taken up at another time.

In consideration of the above and with regard to the project of the village of Brockport as heretofore approved and as modified by this present application, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in the original application, as modified by this and previous revisions, shall be completely constructed in acordance with the plans as hereby revised.

2. All the water to be supplied to any persons in the village of Brockport, or in the towns of Sweden, Clarkson or Hamlin, shall be filtered in the manner to be approved by this Commission.

3. No branch distribution pipes shall be laid in streets or roads in the towns of Sweden, Clarkson and Hamlin, nor shall water be supplied to any of the inhabitants of said towns not resident on the streets and roads through which the force main now passes without the further consent and approval of this Commission, nor shall the village furnish, supply or sell water to any village, water district or other civil division of the State until such time as such water district, village or civil division has made application to and received the approval of this Commission for such project.

4. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Board of Water Commissioners of the village of Brockport as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 13th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 127

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the MADRID WATER DISTRICT, for approval of its maps, plans and profiles for a municipal water works system.
} *Decision*

Application filed August 31, 1912.
Hearing held at Madrid, September 25, 1912.
Decision, May 16, 1914.
Denied.

The petition of the Madrid water district, by its board of water commissioners, together with the maps, plans and profiles, sets forth the following:

That a petition duly signed by a majority of the owners of the real property within the proposed district together with a map of said district was duly filed with the town clerk of the town of Madrid on the 24th day of July, 1912, and, after legal notice was published, the town board of said town of Madrid did upon the 5th day of August, 1912, meet in the town hall in said village of Madrid and, after duly and carefully considering and examining said petition and map, did upon that day lay out a water district consisting of the lands and dwellings within the boundaries of the district, as marked out in said map.

That the property within the boundaries of said district is of the value of $300,000, and the population of said district at the last official census was 850 and is about the same number now.

That the purpose of establishing said water district is principally for fire protection and also for the purpose of furnishing water to the inhabitants of said district for purposes other than drinking and cooking.

That the water is to be taken from Grasse river near the dam at Madrid village and is to be pumped to a standpipe in or near the Madrid cemetery and distributed from said standpipe. The pumps are to be installed in a building near the dam. No sewers are to be installed.

That said water district is laid out under and by virtue of chapter 451 of the laws of 1900, and amendments thereto as found in article 13 of the town consolidated laws, sections 282–296. The maximum sum proposed to be expended for installing said water system is $22,000, which sum is proposed to be raised by issuing bonds payable within twenty years.

That Madrid village and Madrid springs have no fire protection nor water supply system at present and it is proposed to be able to furnish sufficient water for all the inhabitants of said district by the proposed water system.

That the only land to be purchased is a small plot or parcel upon which to erect the standpipe and possibly a site for a building in which to install the pumps. No watershed or persons or property will be damaged by the installing of such system.

That the exhibits accompanying this petition are:

a. Copy of the petition with description of district and written report of the engineer.

b. Map of proposed district.

c. Copy of notice published by town clerk.

d. Copy of town board laying out district and appointing water commissioners.

That the Grasse river is the only source from which water can be procured, and the estimated expense for carrying on said water system per year is about $900.

A sanitary analysis of the water from Grasse river at Madrid, under date of October 10, 1912, and signed by L. K. Russell, an analyst, was submitted, in addition to which an analysis was made by the State Department of Health. Said water was found to be contaminated, not potable, unsafe and dangerous to public health and unfit for a water supply for all public and domestic purposes, unless first filtered and chemically treated.

That after careful examination and consideration of all the papers submitted and of the evidence taken at said hearing, the Commission finds and determines:

That it would be a menace to the public health, safety and welfare to permit the construction of a water works system for fire protection, steam boilers, street sprinkling, etc., only, supplying therefor water of a quality and condition impure and dangerous to public health if taken into the digestive systems of human beings and that, notwithstanding any local laws or ordinance which might be enacted to the contrary, such water will inevitably be taken into the digestive systems of many human beings.

Therefore, upon the above grounds and the further grounds of legal defects in the organization of the Madrid water district, the application is hereby denied.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and denial to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 16th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 142

VILLAGE OF BLOOMINGDALE, Essex county, N. Y.
Application filed June 24, 1913.
Hearing held July 18, 1913.

Petition asks for approval of municipally owned water supply system already constructed in this village without due authority from the State.

Water is obtained from a driven well near Sumner creek within the limits of the village. The total cost of the system was $21,000.

In order to protect the purity of the water certain additional construction was required by this Commission. Various required alterations have been made at the pumping station. Final approval is being withheld until further analyses of the water from this well have been made.

WATER SUPPLY APPLICATION NO. 144

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the CITY OF YONKERS to the Conservation Commission, for the approval of its maps, plans and profiles for a new and additional source of water supply from the watershed in Westchester county and for the extension of its works outside of its original jurisdiction.

Decision

Application filed July 11, 1913.
Hearing held in Yonkers, July 28, 1913.
Decision November 7, 1913.
Approved.

This application was made by John A. Brady, Commissioner of Public Works, on behalf of the city of Yonkers and was verified by said John A. Brady and Joseph F. O'Brien, city clerk. The application was filed in the office of the Conservation Commission July 11, 1913.

After due notice published in the *Herald*, *Statesman* and *Observer* of Yonkers, the Mt. Pleasant *Sentinel*, Mt. Vernon *Evening News and Freeman*, and the Tarrytown *Press Record*, a hearing was held on this petition in the common council chamber in the city hall of the city of Yonkers on the 28th day of July, 1913, at 11 A. M. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioner was represented by Max Cohen, Esq., Assistant Corporation Counsel. No objections to the granting of this application were filed and no one appeared in opposition.

The city makes application for permission to use the watersheds of Saw Mill river and Sprain brook as new and additional sources of water supply for the city, to acquire land and water rights, and to construct, on these watersheds and elsewhere, such reservoirs and other appurtenant works as may be necessary to make water from these sheds available for the use of the city. The complete project includes the acquisition of title to, or the use of, Woodlands lake, an existing artificial pond on Saw Mill river and the construction of: a reservoir of 560,000,000 gallons capacity on Saw Mill river at East View; a reservoir of 380,000,000 gallons capacity on Sprain brook; a new reservoir with a capacity of 4,700,000,000 gallons on Grassy Sprain brook, covering the site of the existing reservoir; a conduit to carry Saw Mill river water from Woodlands lake to Sprain reservoir; an intercepting dam at the head of Sprain reservoir and a connecting tunnel between the two Sprain reservoirs to allow Saw Mill river water to be delivered to either of these basins without interference with the other; a booster pumping station on this connecting conduit, to pump water into the upper part of Grassy Sprain reservoir, which is above the level of Woodlands lake; a pipe line connecting the Sprain reservoirs with the existing Tube Well pumping station; additions to the existing filter plant at this station to give a total filter area of four acres and a clear water basin; additions to the Tube Well pumping station, consisting of the installation of two 10,000,000 gallons per day pumping units, with the necessary auxiliaries and extensions of the station building; a pipe line connecting this station with the existing Fort Field reservoir; and the enlargement and covering of one portion of this reservoir to give a storage capacity for filtered water of 38,000,000 gallons. Upon the completion of the proposed project, the flood waters of the Saw Mill river are to be diverted into and stored in the Sprain reservoirs and are to flow from them by gravity to the enlarged filter plant, where the water is to be purified by passage through slow sand filters and by sterilization. From the clear water basin of this plant the purified water is to be pumped by existing and proposed pumping units to the Fort Field reservoir, and thence is to be delivered into the city distribution system.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the Commission's engineer, it appears as follows:

Yonkers is a city in Westchester county, organized and existing under the provisions of chapter 866 of the laws of 1872, chapter 452 of the laws of 1908, as amended, and other laws. By law, the commissioner of public works of this city has cognizance, direction and control of the construction, maintenance, extension, repair and care of the city water works. John A. Brady, who verifies this application, is the duly appointed and acting commissioner of public works for said city. In 1910 the population of Yonkers was 79,803 and the present population of said city is now estimated to be 90,000. The last roll shows the total assessed valuation of all taxable property within said city as $91,903,517. Yonkers has a total outstanding indebtedness of $9,505,681.01, of which amount $2,505,750 is represented by bonds issued for purposes of water works construction. The present sinking fund amounts to $2,494,750.

Yonkers is supplied with water by works owned and operated by the municipality. The construction of these works was started in 1874 and they have been added to, extended and remodeled at various times up to the present. There are three principal sources of supply now in use: Grassy Sprain reservoir, driven wells in the valley of Saw Mill river and the waters of Saw Mill river.

Grassy Sprain brook is a tributary of the Bronx river. On it has been constructed a reservoir of 940,000,000 gallons capacity, which has a tributary watershed of about two square miles. Water from this reservoir runs by gravity to the Low Service pumping station and from thence is pumped into the distribution system. A canal diverts water from the upper portion of the watershed of Sprain brook, another tributary to Bronx river, which lies immediately to the west of Grassy Sprain watershed, into the upper end of Grassy Sprain reservoir. This diversion increases the watershed tributary to the reservoir and thereby adds to the yield therefrom.

Fourteen driven wells have been sunk along the valley of Saw Mill river, northerly from the thickly populated part of the city, and the Tube Well pumping station, installed at this point, pumps water from these wells into the distribution system.

An intake pipe has been built from the Tube Well station into Saw Mill river, and through it water from this stream is diverted, purified by passing through slow sand filters and by sterilization, and pumped into the distribution system.

Two distribution reservoirs are provided, one of 60,000,000 gallons and one of 4,500,000 gallons capacity. There are also two high service water towers and the necessary high service pumping equipment to supply water to them. The distribution piping is extensive, covering a considerable portion of the area of this city.

The estimated safe yield from these existing sources is less than 10,000,000 gallons per day, and this yield is obtained only by pumping the maximum amount of water possible from Saw Mill river, the amount pumped being limited by the amount in the river and the capacity of the filter plant, and conserving the water stored in Grassy Sprain reservoir for use during the low water period. In order to increase the amount obtainable by this method of operation, the city authorities have already authorized the enlargement of the existing filter plant and the installation of one of the 10,000,000 gallon per day pumping units included in the project now under consideration.

The present consumption of the city averages 10,000,000 gallons per day and exceeds this amount during the warm months. The population is increasing rapidly and the water consumption is increasing in proportion. All the connections are metered, but, due probably to the large use of water by manufacturing industries, the per capita consumption of about 110 gallons per day is somewhat high. At various times during the past few years, and particularly in 1909 and 1910, there was serious shortage of water in this city and water had to be purchased from the city of New York and from the Consolidated Water Company of Suburban, N. Y. The need of the city of Yonkers for a greater available supply of water has been clearly proven.

In December, 1910, a joint water supply committee was appointed to investigate possible sources of water supply for this city. This joint committee was composed of a committee of five aldermen, appointed by virtue of a resolution of the Common Council passed September 12, 1910, a committee of seven business men, appointed by the Mayor on December 27, 1910, and the Commissioner of Public Works. This committee engaged the services of the firm of Hazen & Whipple, Consulting Engineers, and made extensive investigations. The engineers reported in November, 1911, stating that they had found a number of possible sources of supply, describing the works necessary in order to make available water from each, and giving the estimated cost of each project. The Joint Committee selected from the sources recommended the project now under consideration, and on January 8, 1912, submitted to the Common Council of the city of Yonkers a report recommending the adoption of this scheme. The report of the Joint Committee was referred to the Committee on Police, Fire and Water of the Common Council and was considered by that committee for a period of over a year. On the 14th day of April, 1913, this latter committee reported to the Common Council and recommended the adoption of the project now under consideration. This report was formally adopted by the Common Council on that date. The present petition to the Conservation Commission was authorized by Special Ordinance No. 179, passed by the Common Council on the 9th day of June, 1913. A petition was filed with the Conservation Commission June 20, 1913, but was returned for revision and amendment and was finally replaced by the petition filed July 11, 1913.

Saw Mill river above Woodlands lake has a drainage area of approximately 21 square miles, and the flood flow of this stream is at present largely unavailable for water supply purposes. It is proposed to conserve this flow by storing it in the three storage reservoirs proposed in this project and it is believed that by so doing a dependable supply of 18,000,000 gallons per day will become available. On the completion of the proposed project the total drainage area tributary to the city water works will be 26.3 square miles, which, with sufficient storage capacity, could be depended upon for an even greater yield.

Saw Mill river is contaminated to a considerable degree and the waters thereof are unfit for domestic consumption without purification. The waters of Sprain and Grassy Sprain brooks are of better sanitary quality, but they are not above suspicion, and it is advisable that water from these streams be filtered before being used for domestic consumption By the proposed method of utilization, the waters of the Saw Mill river are to be stored for a considerable period before going to the filters, and this storage alone will materially improve the sanitary condition of this water. The filters now, or about to be installed, are of the slow sand type, which, with proper operation, at rates not exceeding those indicated by good practice, will be capable of removing from this water a large proportion of bacteria and other undesirable elements therein. In addition, the filter effluent is to be treated with chlorinated lime, or other sterilizing substance, before entering the distribution mains. It appears that, with this method of operation, if the filters are properly constructed and operated with care and intelligence, the water supplied to the people of the city of Yonkers will be of suitable sanitary quality.

It will be required, as soon as the works reach a sufficient degree of completion that all the water furnished to the city from these various sources be filtered in a satisfactory manner and that the city shall install all necessary apparatus and shall provide suitable operating force and materials to carry out this requirement. It will also be required that the State Department of Health be requested to enact suitable rules to protect the sanitary condition of these various watersheds. Particular efforts will be required on the part of the city during the prosecution of construction work upon any watersheds used by it to maintain proper sanitary conditions in labor camps and on the works. To this end it will be required that proper requirements as to sanitary conditions be incorporated in the contracts and specifications for the work.

The estimated cost of the whole project is $3,073,000, but it is not proposed to carry out all of this work at the present time, nor has the construction thereof been authorized by the common council. It is estimated further that on completion of this project, the annual cost to the city will be $266,000 in addition to interest and sinking fund charges on existing works. The cost per million gallons of water delivered is estimated to be $41, which amount must also be increased by interest and sinking fund charges on existing works.

Detailed plans and specifications of these proposed works were not submitted for the reason that they have not yet been prepared. It will be required that such plans and specifications be submitted before any works are built and that no works shall be built except in accordance with plans and specifications which have been so submitted and approved by this Commission.

Considerable areas of land will be required for the completion of this project, all of which land lies within the limits of Westchester county and most of which is within the lmits of the city of Yonkers. The exact amount of land required and the limits thereof have not yet been determined

Although the city makes application for approval by this Commission of the entire project as outlined above, only a portion of this has been authorized for construction at the present time. The city, however, desires to obtain approval of the whole project and to be allowed to construct the various works and purchase the land necessary therefor from time to time as the city government may direct. This procedure seems equitable and will be permitted.

Various alternative sources of supply exist. Upon the completion of the work necessary to deliver Catskill water into Croton lake, Yonkers will have the right to purchase water from the various aqueducts of the city of New York. It is believed that such water cannot be purchased except at a cost largely in excess of the cost of water delivered by the proposed works. The engineers have recommended the use of Peekskill creek and certain of its branches as an additional source of supply and water might also be made available from Pocantico creek and Popolopen creek.

As it was feared that if the city of Yonkers attempted to acquire water rights in any of these streams complications with regard to the rights or other municipalities in Westchester county would ensue, the city has considered that the Saw Mill river offers the most available source of supply.

The waters of certain tributaries of the Saw Mill river are now used as sources of water supply by the villages of Tarrytown and Pleasantville. Various other villages, communities and districts in this county might use these waters. It is the duty of this Commission to protect the water supply interests of all communities in the State, both for the present and future, and it will therefore expressly reserve the right to permit other municipalities or civil divisions of the State to take water from this stream, if at a later date it shall appear just and equitable to allow them to do so.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and the work done thereunder be subject to the following conditions:

1. Before any works, covered by this approval, are constructed, detailed drawings and specifications therefor shall be submitted to this Commission for approval, and such works shall be constructed only in accordance with drawings and specifications which have received the approval of this Commission, and any such structure shall be completely constructed in accordance with such drawings and specifications.

2. All water hereafter taken from the Saw Mill river and, after such time as the Commission may direct, all water taken from any of the reservoirs covered by this approval shall be purified by filtration and otherwise to the satisfaction of this Commission before being delivered to the distribution mains of the city of Yonkers. The city shall furnish and maintain such apparatus, operating force and supervision as may be deemed necessary to accomplish proper operating results.

3. The said city shall immediately make application to the State Department of Health for the enactment of new rules or the amendment of existing rules for the proper regulation of the various watersheds covered by this application, such rules to be suitable for conditions as existing at the present time and as will exist during construction operations and after the works are completed, and the said city shall vigorously carry out the requirements of that department. The said city shall make special provision in contracts and otherwise for the proper sanitary regulation of labor camps and the conditions in and about any work which is being carried on on any watershed used by said city as a source of water supply.

4. Nothing in this approval shall be construed as giving the city of Yonkers the exclusive right to all of the flow of the Saw Mill river as against any municipal corporation or other civil division of the county of Westchester, or any person or waterworks corporation engaged in supplying or proposing to supply the inhabitants of any municipal corporation or other civil division of the said county with water which may now be taking, or may hereafter be granted the right to take water from this stream or its tributaries above the present Tube Well station of the city of Yonkers.

5. After the completion of these works, or any portion of them, they shall be inspected by and be subject to the approval of this Commission, and no

works constructed pursuant to the authority given by this approval shall be operated until permit to do so has been issue by this Commission, as provided by section 523 of the Conservation Law.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 7th day of November, 1913.

CONSERVATION COMMISSION.
GEORGE E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 147

VILLAGE OF LISLE, Broome county, N. Y.

Application filed September 23, 1913.

Hearing held in Lisle, November 5, 1913.

Petition asks for approval of the project of constructing a municipally owned water supply system in the incorporated village of Lisle. It is proposed to obtain a gravity supply of water from three springs. Estimated cost, $8,000.

Upon investigation it was found that the proposed works would not give a supply adequate for all the needs of the village. Further investigations are in progress and the village authorities expect to modify their plan. Decision has been withheld until these investigations are completed.

WATER SUPPLY APPLICATION NO. 148

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the WATER DISTRICT OF HAMLIN, N. Y., for approval of its plans, etc., for a proposed water distribution system.
} *Decision*

Application filed November 6, 1913.

Hearings held at Rochester November 25, 1913, January 21, 1914, and January 30, 1914.

Decision March 19, 1914.

Approved.

Frank E. Penner, Arthur Seaman and Charles S. Craig, water commissioners for the water district of the town of Hamlin, Monroe county, N. Y., on November 6, 1913, filed with the Conservation Commission an application for approval of the plans of the petitioners for the construction of a water supply system in said water district and the obtaining of a source of water supply therefor. This petition was amended by a supplemental petition filed January 21, 1914.

After due notice, published in the *Rochester Herald*, the *Rochester Democrat and Chronicle* and the *Union and Advertiser* of Rochester, a hearing was held on this petition in the office of the State Superintendent of Elections in the city of Rochester on November 25, 1913, at 9:30 A. M. Pursuant to adjournment, further hearing was held on January 21, 1914, and further evidence was submitted on January 30, 1914. At these hearings the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioners were represented by Isaac M. Brickner, Esquire, their attorney. Objections to the project were filed by Norris Fishbaugh, R. Juberville, S. Wright and twenty-nine others, owners of taxable real property in the proposed water district. At the hearings Norris Fishbaugh and Fred Fishbaugh appeared in person and the objectors were represented by Willis A. Matson, Esquire, of Harris, Beach, Harris & Matson, their attorneys.

It is proposed to obtain water for the Hamlin Water District from the force main of the village of Brockport, which passes through the center of the district. It is proposed to lay a 6-inch pipe paralleling this force main for about a mile and connect with it at either end by pressure reducing valves and meters. Branch pipes connected to this 6-inch pipe are to be laid in the remaining streets of the district. In all 3,540 feet of 6-inch diameter cast-iron pipe are to be laid. Twenty hydrants are to be installed for fire protection.

It was contended by the objectors that the paralleling of the Brockport main is unnecessary, as houses, hydrants and branch pipes can be directly connected to it. By so doing a large proportion of the cost of the 6-inch main can be saved to the district.

After due study of the petition and its exhibits, the evidence and arguments given at the hearings and the report of its engineers, is appears as follows:

Hamlin Water District covers part of the town of Hamlin in the county of Monroe; it lies on the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River Railroad and on the main highway which runs north from the village of Brockport to Lake Ontario. A petition to the town board of the town of Hamlin asking that this district be formed, duly signed and acknowledged by certain of the owners of taxable real property therein, was filed with the town clerk of said town on the 16th day of August, 1913. At a meeting of said town board, held on September 2, 1913, it was determined that the above-mentioned petition was in fact signed and acknowledged by a majority of the owners of taxable real property within the proposed district and an order was made establishing the water district as therein requested. By this order Harry Burke, Everett Barringer and F. E. Penner were appointed water commissioners, but the eligibility for office of some of these persons was questioned and, at this same meeting, their appointments were rescinded. Subsequently, at a meeting held on September 17, 1913, Frank E. Penner, Arthur Seaman and Charles S. Craig, the applicants in this proceeding, were appointed water commissioners for this district. They subsequently qualified for office and filed the necessary bonds with the town clerk.

It is shown in the petition to the Conservation Commission that the assessed valuation of property within the district is $150,000, the population about 500 and the authorized expenditure for the construction of the water works system is $10,000.

Hamlin Water District is at present without any public water works system. Water for domestic purposes is abtained from ordinary wells, and for fire protection is obtained from these wells and from small local streams. There is no question but that need exist for a public water supply, if such can be obtained at a reasonable cost.

Water is to be obtained from the force main of the village of Brockport. Water is pumped from Lake Ontario to the latter village through a 14-inch cast-iron main, which passes through the longer axis of this district. Before entering this main all water is to be filtered through a battery of mechanical pressure filters. Plans of the Brockport water works system were submitted to the Conservation Commission for approval on August 23, 1912, and approved by it on December 7, 1912; certain changes in the original plans were approved on March 25, 1913. The system is now nearly completed.

The estimated cost of the proposed works is about $9,500. It is understood that a contract has been signed for the construction thereof at prices which indicate that the works can be constructed without exceeding this appropriation.

The proposed works, if fully constructed in accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, and if properly maintained and operated, will be safe and will give adequate service both for domestic supply and fire protection. Provisions of the franchise permitting the construction of the Brockport main and the necessities of that village for water will probably result in such operation of the Brockport system as to give a continuous supply to this district.

Pressures in the Brockport main will be higher than is usual in a water distribution system, running up to 210 pounds per square inch or over. It would be possible to serve the people of this district with water for domestic use and fire protection by direct connections to this main by the use of pressure regulating valves on each house connection and branch pipe and a special type of fire hydrant. By so doing the laying of nearly a mile of 6-inch cast-iron pipe would be avoided and possibly a saving in cost of $3,500 might be made. From an operative and administrative viewpoint, the project proposed is preferable to that suggested by the objectors, particularly in a water district. It is by no means self-evident that the possible saving in cost will offset these disadvantages of operation and administration, and, unless material advantage can be shown, this Commission would not be justified in requiring any change in the plans of the applicants.

The plans as submitted are satisfactory, except that (1) a suitable pressure relief valve should be installed in the 6-inch main as near as possible to the meter, and set to open under a pressure ten pounds higher than the desired working pressure in that main. (2) Any valve by-passing a meter connected with the Brockport main should be so arranged that it can be locked shut and sealed in that position. Furthermore (3) the interests of the people of Brockport should be protected by limiting the amount of water that can be sold to the Hamlin water district.

All pipes and other structures are to be placed in public streets and roads, so that no land will be taken or acquired.

If constructed in accordance with the approved plans, the capacity of the Brockport water works will be sufficient to supply the needs of this district in addition to those of the village. Further, there appears no reason why the execution of the project of the applicants will in any way adversely affect the water supply requirements of any municipality or civil division of the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the applicants shall comply with the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans and specifications submitted.
2. On the 6-inch main, near the meter, a satisfactory pressure relief valve shall be installed to protect the house services from undue pressure.
3. Any valve by-passing a meter connected with the Brockport main shall be so arranged that it can be be locked shut and when so locked may be sealed by the village of Brockport.
4. Until otherwise ordered by this Commission, Hamlin water district shall not be allowed to draw a quantity of water exceeding one hundred gallons for each inhabitant thereof in any one day, except in case of fire.
5. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Water Commissioners of the Hamlin Water District as thus modified.

In witness whereof, the Conservation Commission has caused this determination and approval to be signed by the Commission and has [L. S.] caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 19th day of March, 1914.

CONSERVATION COMMISSION.
George E. Van Kennen,
James W. Fleming,
John D. Moore,
Conservation Commissioners.

Attest: Albert E. Hoyt,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 149

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the Sylvan Spring Water Company, for approval of the engineering and financial plans for the acquisition of an additional water supply, also to condemn lands in connection therewith and extend their works outside of the limits of their original jurisdiction.
} *Decision*

Application filed November 6, 1913.
Hearing held at Albany November 28, 1913.
Decision January 13, 1914.
Approved.

The Sylvan Spring Water Company on October 29, 1913, made application to the Conservation Commission for approval of the project of said company for the acquisition of an additional water supply and of lands for such new and additional source of water supply, for the approval of the proposed works in connection therewith and for the approval of certain proposed extensions in the franchise limits of the company. This application was filed in the office of the Conservation Commission on November 6, 1913. On November 26, 1913, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice, published in the Oneida *Democrat* and the Rome *Daily Sentinel*, a hearing was held on this petition in the office of the Conservation Commission in the city of Albany on November 28, 1913, at 2 p. m. At this hearing the commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioner was represented by Joseph Beal, Esq. No objections were filed and no one appeared in opposition to the project.

The Sylvan Spring Water Company proposes to utilize, as a new and additional source of supply, a portion of the flow of a stream which runs through the town of Vienna, Oneida county, in a southerly direction to join Fish creek at Fish Creek Landing. A short distance above the hamlet of Vienna there is a mill pond, known as the Roantree reservoir, which has been purchased by this company and which it is proposed to use as a storage reservoir. The existing pond has a capacity of about 1,825,000 gallons and this capacity can be increased, if desired, at comparatively small expense.

It is proposed to make certain repairs on the dam, to clean up the reservoir and the immediate surroundings thereof and to connect this reservoir with the existing pipe line and reservoir of the company by 5,684 feet of 8-inch cast-iron pipe. On the end of the intake pipe is to be built a timber crib filled with gravel, which will act as a rough strainer. Below the dam is to be constructed a small gate house for the control of the water. In addition a blow-off pipe is to be installed, passing through the dam at the site of the penstock of the original mill. In the gate house it is proposed to make provision for a branch pipe to supply Vienna. In addition to acquiring and utilizing this additional supply, the company desires the approval of this Commission for proposed extensions of its franchises to allow it to supply water to persons living along the line of the pipe above mentioned, and also to allow it to supply water to the hamlet of Vienna.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineer of the Commission, it appears as follows:

Sylvan Spring Water Company is a domestic corporation, organized under the Transportation Corporations Law June 22, 1894, for the purpose of supplying water to that portion of the town of Vienna known as Sylvan Beach and that portion of the town of Verona known as Verona Beach, both these towns lying within the county of Oneida. The capital stock of this company is $35,000, fully paid in, and, in order to construct these proposed works, the increase of this stock to $50,000 was authorized on October 9, 1913. The company has no indebtedness other than $4,000 borrowed for the purpose of purchasing the Roantree reservoir and certain water rights. This $4,000 debt is to be paid from the proceeds of the said additional issue of capital stock. The population supplied by this company varies from about 250 in the winter to 12,000 to 18,000 persons on certain days during the summer resort season.

At present this company obtains its water from the Hallenbeck reservoir, situated on a small tributary to Fish creek about two and one-half miles north of Sylvan Beach and about a mile east of North Bay. This reservoir has a capacity of 1,500,000 gallons, a tributary watershed of about one and one-half square miles and an elevation such as to give pressure of from 32 to 37 pounds per square inch in Sylvan Beach During the drier periods of past years, which periods correspond to the maximum demands for water in the district supplied, this stream has not yielded sufficient water for the needs of the company. At various times the reservoir has been completely empty, thereby rendering useless the fourteen fire hydrants installed in Sylvan Beach, and, in order to supply its customers with any water, the company has been obliged to pump from Oneida lake. The lake water is contaminated and unfit for domestic use without purification, facilities for which have not been installed. It is estimated that the maximum demand for water amounts to 75,000 gallons per day. Water from Hallenbeck reservoir appears to be of excellent quality, but it is evident that the company needs an additional supply of water from some source.

At a meeting of the board of directors of this company, held on August 8, 1913, the construction of the proposed works, as shown by the plans prepared by J. M. Hutton, engineer for the company, was authorized, as was also the making of this application to the Conservation Commission. Certain changes in the arrangement of the piping at the Hallenbeck reservoir were authorized at a meeting of said board held January 3, 1914.

Roantree reservoir has a tributary watershed area of about one and one-half square miles and the yield therefrom has been so great that even during the driest portion of the past summer certain mills in the hamlet of Vienna were able to operate by water power. On September 1st last the flow from this reservoir was gauged and found to be 0.63 cubic feet per second, or approximately 400,000 gallons per day.

An analysis of this water was submitted, which indicates that it is of excellent quality from physical, chemical and bacteriological standpoints. An inspection of the watershed shows it to consist largely of woodland, abandoned farms and farm lands free from any apparent source of contamination, with the single exception of a certain barn and other outbuildings close to and immediately west of Roantree reservoir. The company proposes to acquire the land on which these buildings stand, to move them off the watershed and to thoroughly cleanse the sites thereof. If this is done, the water from this reservoir will be of suitable quality for potable use without further purification. In order, however, to insure that this condition shall persist, it will be required that the company make application to the State Department of Health for the enactment of suitable rules for the sanitary protection of all watersheds used by it.

The estimated cost of the proposed construction as given in the report of the engineer, is $7,731.64. The additional cost of land damages, water rights, engineering, etc., brings the total cost of this project up to $14,231.61. It appears that this project can probably be completed without exceeding this sum, the expenditure of which has been authorized.

The proposed works, if constructed in accordance with the plans filed with the application, as revised by a plan of the outlet works filed December 4, 1913, and by three plans filed January 9, 1914, of suitable materials and with satisfactory workmanship, will be safe and adequate for the purpose for which designed.

The company has already acquired Roantree reservoir and two smaller ponds and mills situated on the stream lower down. It will be necessary for it to acquire a strip of land on which stands the barn mentioned above, a right of way for the pipe line from Roantree to Hallenbeck reservoir and to pay certain damages on account of diversion of water from the stream. It is expected that these matters can be satisfactorily adjusted without recourse to condemnation proceedings.

Alternative sources of supply exist. The yield from the present watershed can be increased by the construction of additional storage. The storage on this watershed can be more than doubled at comparatively small expense by the repair of an old dam immediately up stream from Hallenbeck reservoir. Oneida lake would furnish an inexhaustible supply of water, but this would have to be filtered and pumped. It is probable that at the present time Roantree reservoir affords the most feasible additional source of supply for this company.

The taking of water from this stream for the supply of Sylvan and Verona Beaches will not affect the present necessities of any municipality or civil division of the State which has a water supply system. This reservoir is, however, the logical and perhaps the only source of supply for the hamlets of Vienna and Fish Creek Landing. If the company obtains a franchise to supply Vienna, the necessities of this hamlet will be adequately cared for and this Commission tentatively approves of such an extension of franchise limits. If, however, the inhabitants of the hamlet of Vienna should form a water supply district, or in some other way provide for the installation of the water supply system, they should be allowed to obtain their water from this watershed, after having made equitable arrangements with the Sylvan Spring Water Company. The hamlet of Fish Creek Landing should have the same privilege.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provision for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans, as submitted, shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. Before any water drawn from the Roantree reservoir shall be supplied to the inhabitants of Sylvan and Verona beaches, the water company shall

make application to the State Department of Health for the enactment of suitable rules for the sanitary protection of all watersheds used by that company, and thereafter said company shall diligently enforce the requirements of such rules as may be enacted.

3. The inhabitants of the hamlets of Vienna and Fish Creek Landing, in the town of Vienna, Oneida county, N. Y., shall, if they desire to establish a public water supply system and obtain the consent and approval of this Commission therefor, be permitted to take water from this watershed for the purpose of supplying such water supply system, after making equitable arrangements with the Sylvan Spring Water Company for such taking.

4. After these works have been constructed, they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Sylvan Spring Water Company as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 13th day of January, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 150

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the WILLIAMSON WATER DISTRICT, for a new and additional supply of water.
} *Decision*

Application filed December 4, 1913.
Hearing held at Rochester, December 22, 1913.
Decision December 31, 1913.
Approved.

On December 4, 1913, Richard M. Cheetham, Kerrison M. Davies and Abraham F. De Hond, commissioners for the water district of the town of Williamson, filed in the office of the Conservation Commission an application asking for the approval of that Commission for the plans of the petitioners for installing a water supply system in the Williamson water district and the use of Lake Ontario as a source of water supply therefor. On November 25, 1913, the Commission had caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice, published in the Williamson *Sentinel*, the Sodus *Record*, the *Rochester Herald*, and the Rochester *Union and Advertiser*, a hearing was held on this petition in the office of the State Superintendent of Elections in the city of Rochester on December 22, 1913, at 10 A. M. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioners appeared at this hearing in person and were there represented by Henry O. Button, Esq., their attorney. No objections were filed and no one appeared in opposition.

The project for which approval is desired comprises a complete water supply system for the Williamson water district. Water is to be obtained from Lake Ontario, near the hamlet of Pultneyville in the town of Williamson, Wayne county, N. Y. An intake crib is to be constructed in the lake 600 feet from shore at a point where the water has a nominal depth of 10 feet. Water is to flow from this crib through a 12-inch cast-iron pipe line to a concrete receiving well, to be constructed on the shore of the lake. From this well water is to be pumped by a single stage centrifugal pump, driven either by electric motor or oil engine and having a capacity of 300 gallons per minute, into a sedimentation basin. This basin is to be constructed of concrete and is to be approximately 44 feet by 34 feet in plan and 8 feet deep, with a capacity of about 40,000 gallons. It is to be provided with baffles to insure an even distribution of flow through it. Coagulating chemicals are to be added to the water as it enters this basin. From the sedimentation basin water will flow by gravity to a pump well connected with the high lift pump. From this well the water is to be pumped through steel tank pressure filters to the water district and distribution reservoir. The high lift pump is to be either a triplex plunger or horizontal duplex center-packed plunger power pump, driven either by electric motor or oil engine and is to have a capacity of 300 gallons per minute against the dynamic head necessary to force water into the distribution reservoir. Two steel pressure filters of 400,000 gallons per day capacity each are to be installed, these filters being of the horizontal tank mechanical pressure type. Pumps and filters are to be housed in a substantial building and sufficient room is provided to install duplicate pumps and motors and two additional filters. Apparatus for sterilizing the water is to be provided. From the filters to the railroad at Williamson is to be laid a force main consisting of 18,000 feet of 10-inch cast-iron pipe. From the railroad to the reservoir this main is to be 8-inch cast-iron pipe. Through the remainder of the water district a distribution system, consisting of 8-inch and 6-inch cast-iron pipe is to be installed. It is proposed to lay approximately 8⅓ miles of pipe altogether. In the water district 59 double nozzle fire hydrants are to be installed where necessary to give fire protection for all buildings. On Nichols Hill, immediately south of the inhabited portion of the district, is to be constructed a distribution reservoir with a capacity of 500,000 gallons, situated at such an elevation as to give pressures of from 30 to 60 pounds per square inch over the various inhabited portions of the district. This structure is to be uncovered, circular in plan, 85 feet in diameter, with concrete walls backed by earth embankment and is to be paved with concrete. The maximum depth of water therein is to be 13 feet.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the Commission's engineer, it appears as follows:

The petitioners are the commissioners of the Williamson water district, which district covers the unincorporated village of Williamson, in the town of Williamson, Wayne county. This village is situated in the northerly part of said county on the line of the Rochester & Sodus Bay Electric Railroad and the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River Railroad. It is about 3½ miles distant from the shore of Lake Ontario and due south of the port of Pultneyville. This water district was duly formed by the town board of said town of Williamson on the 22d day of November, 1913, acting upon a petition to said town board dated August 15, 1913, and filed with the town clerk November 3, 1913. The petitioners are the duly appointed, qualified and acting water commissioners for said district and as such, on the 2d day of December, 1913, signed and verified this petition to the Conservation Commission.

The petition states that the population of the water district is about 950 and that in addition to supplying these persons with water it is desired to supply the inhabitants of Pultneyville and the residents of the town of Williamson living along the highway from Pultneyville to the village of Williamson, an additional population of about 425, or a total population to be supplied of 1,375. The total assessed valuation of all taxable property in the town of Williamson is $1,630,230 and the assessed valuation of the taxable real property within the water district is $450,000. The total expenditure which has been authorized for the purpose of installing a proposed water supply system is $70,000.

At the present time the village of Williamson is entirely without any system of public water supply. Water for domestic and manufacturing purposes is obtained from shallow wells, either dug or driven, and for fire protection is obtained from these wells, from small streams in the neighborhood of the village and from cisterns filled from these streams. The water now available is at times deficient in quantity and is not of unquestionable purity. The fire protection afforded is entirely inadequate and disastrous fires have occurred, which might have been prevented if a suitable water supply system had been installed. It is evident that public necessity for a water supply system exists.

The taxpayers' petition, submitted to the town board, was accompanied by plans, estimates and specifications, prepared by H. C. Kittredge, civil engineer, of Rochester, and copies of these plans and papers were submitted with the application to the Conservation Commission.

The proposed source of supply for this district is Lake Ontario and therefore the quantity of water available is limited only by the capacity of the pumping plant installed.

Analyses submitted with the application show this water chemically to be typical for this lake and bacteriologically to have been comparatively uncontaminated at the time the samples were taken. These analyses also show that at a distance of 1,000 feet from shore the water was markedly better than at a distance of 600 feet. The quality of the water of this lake is well known. It is contaminated by sewage draining into it from many towns and cities, large and small. Near the shore it is, at times of storm, very turbid and it is probably seldom safe for potable purposes without filtration. At this particular point the danger from contamination by large quantities of fresh sewage is comparatively remote and by filtration the water can be purified without difficulty so as to be entirely safe for domestic use.

The engineer estimates that the works can be constructed for $70,000 and it appears that this sum will be sufficient for the complete construction of the works, unless unforeseen difficulties in construction or changes in market prices of labor or materials occur.

The works, if completely constructed in general accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, will be safe and will supply the Williamson water district, a portion of the hamlet of Pultneyville and those persons resident along the line of the force main with a sufficient quantity of water of suitable quality and at suitable pressures. If favorable prices are obtained the commissioners propose to make certain improvements in these plans. The plans, as submitted, show mechanical pressure filters. This type of filter, as ordinarily operated, is the least efficient of the many types of filters built. In connection with the ample sedimentation basin provided, and considering the small amount of contamination in this water at the present time, this type of filter will give adequate purification if carefully operated. At comparatively small extra cost, however, mechanical gravity filters of equal capacity could be installed, and the commissioners propose to install such filters if sufficient funds are available. Mechanical gravity filters, at the same cost of operation, will give a higher degree of purification and the installation of such a plant is strongly recommended.

The plans, as submitted, contemplate the installation of but one pumping outfit, although provision is made for the installation of duplicate equipment in the future. It is never prudent, in a system of this character, to rely upon a single pumping unit, and, in this case, any failure of the high lift pump must be repaired before the reserve in the reservoir is depleted, that is, within two days, or the district will be left entirely without water. The commissioners propose to install duplicate equipment if funds are available at the time of constructing the remainder of the system, or, if not, to install such equipment as soon thereafter as possible. It is strongly recommended that such duplicate equipment be installed in the first instance, and if it is impossible to make such duplicate installation complete, that at least duplicate pumps be installed, so arranged that either may be run from a single prime mover or by an emergency installation if necessary.

For the construction of the intake, sedimentation basin and pumping station about 2¼ acres of land are to be acquired, and for the distribution reservoir about 1 acre of land. In addition, rights of way are to be acquired for pipe lines from the pumping station to the highway and from the highway to the reservoir. The remainder of the piping is to be laid in public streets and roads. It is expected that these lands and rights of way can be acquired by private sale and that condemnation proceedings will not be necessary.

It is possible that a sufficient supply of water for the present needs of this district might be obtained at a point nearer the village and at somewhat lesser cost, but it appears that, due to the unfailing quantity of water available in Lake Ontario, the proposed scheme is probably the best available.

The installation and operation of the proposed water works system for the Williamson water district will not in any way adversely affect the water supply interests of any other community in this State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That the said plans provide for the proper and safe construction of all work connected therewith.

Third. That the said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans, as submitted, shall be modified, and the Commission hereby does determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with detailed plans and specifications which shall have been submitted to and approved by this Commission.

2. All the water pumped into the distribution system of this district, or supplied to the inhabitants of this district, or of Pultneyville, or of any part of the town of Williamson, shall be purified in a manner satisfactory to this Commission and the water commissioners shall maintain such supervision of the filter plant and shall provide and use such chemicals for the coagulation and sterilization of the water as may be necessary to fulfill these requirements.

3. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the commissioners of the Williamson water district as thus modified.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and [L. S.] has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 31st day of December, 1913.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 150

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the WILLIAMSON WATER DISTRICT
for a new and additional supply of water.
} *Supplemental Decision*

Supplemental application filed May 25, 1914.

Decision June 1, 1914.

Approved.

On December 4, 1913, Richard M. Cheetham, Kerrison M. Davies and Abram F. DeHond, Commissioners for the water district of the town of Williamson, filed in the office of the Conservation Commission an application asking for the approval of that Commission for the plans of the petitioners for installing a water supply system in the Williamson water district and the use of Lake Ontario as a source of water supply therefor. After holding a hearing upon this application, as required by law, the Conservation Commission on December 31, 1913, approved the application, authorized the construction of the proposed works and authorized the purchase of certain parcels of land necessary for this construction. On May 23, 1914, the above named water commissioners of the Williamson water district made a supplemental petition to the Conservation Commission asking for its approval of certain changes in the boundaries of the land to be acquired for the construction of the proposed water supply system. This petition was filed in the office of the Conservation Commission May 25, 1914.

It appears that the original decision of this Commission authorized the purchase by the water district of certain lands from Mrs. George W. Nichols. This proposed purchase comprises a plot for the site of the reservoir for the system and a right of way for the pipe line leading from said reservoir to the mains of said water system in the highway adjoining the westerly end of said right of way. It is now proposed to enlarge the amount of land to be acquired, the principal change being an increase in the width of the right of way.

By its original decision this Commission authorized the purchase by the water district of a site for the proposed pumping station for said water district, together with a right of way for the pipe line leading therefrom to the mains of said water system in the highway at or near Pultneyville, from one Fred W. Cornwall. It is now proposed to purchase from Mr. Cornwall a somewhat smaller tract in a slightly different location, together with a right of way for the pipe line leading into the lake and another for the pipe line connecting the pumping station with the highway.

The water commissioners have been able to agree with Mrs. Nichols and Mr. Cornwall as to the size and location of the parcels which it is now desired to acquire and to the price to be paid for each, but it is stated that they cannot acquire the parcels originally desired without resort to condemnation proceedings, with resultant delay and expense.

It appears that the lands which it is now proposed to acquire are substantially in the same location and of nearly the same areas as those originally desired and that the modification of the original petition, by substituting for the lands described therein those described in this supplemental petition, will in no way affect the determinations which the Commission made thereon.

In consideration of the above and with regard to the original petition filed December 4, 1913, as modified by the supplemental petition filed May 25, 1914, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That the said plans provide for the proper and safe construction of all work connected therewith.

Third. That the said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans, as submitted, shall be modified, and the Commission hereby does determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with detailed plans and specifications which shall have been submitted to and approved by this Commission.

2. All the water pumped into the distribution system of this district, or supplied to the inhabitants of this district, or of Pultneyville, or of any part of the town of Williamson, shall be purified in a manner satisfactory

to this Commission and the water commissioners shall maintain such supervision of the filter plant and shall provide and use such chemicals for the coagulation and sterilization of the water as may be necessary to fulfill these requirements.

3. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said supplemental application of the Commissioners of the Williamson water district as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed thereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 1st day of June, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 151

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of CLOVER STREET WATER DISTRICT
of Brighton, N. Y.
} *Decision*

Application filed January 7, 1914.
Hearing held at Rochester January 21, 1914.
Decision January 29, 1914.
Approved.

Isaac J. Hartfeldt, George M. Keller and James E. Smith, water commissioners for the Clover Street water district in the town of Brighton, Monroe county, N. Y., on January 7, 1914, filed with the Conservation Commission an application for approval of the project of the petitioners for obtaining a supply of water and constructing a water supply system in said district.

After due notice, published in the *Union and Advertiser* of Rochester and the *Rochester Herald*, a hearing was held on this petition in the Monroe

County Court House in the city of Rochester, on January 21, 1914, at 11:30 a. m. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners appeared in person and were represented by C. Porter Downs, Esq., their attorney; E. C. Smith, Esq., appeared for Emil Laass and for the executor of the Curtis Estate, objectors.

It is proposed to construct a complete water-works system in the Clover Street water district. Water for this system is to be obtained from the mains of the Rochester & Lake Ontario Water Company. Connections are to be made to these mains at two points, at each of which a meter is to be installed. The whole system is to consist of 16,200 feet of 6-inch and 3,360 feet of 4-inch cast-iron pipe, to which are to be connected 26 fire hydrants, so located that the maximum spacing between them will be 500 feet. Meters, valves and other appurtenances are to be installed on these pipe lines in the usual manner.

Objection to the granting of this application was made by Mr. Laass and by the executor of the Curtis Estate, on the grounds that, although they had signed the original taxpayers' petition to the town board of Brighton, all the property of Mr. Laass and all but a small portion of the Curtis Estate had been excluded from the district as formed. In reply to these objections it was stated by the petitioners that it had been their intention to include this property in the district, but that, through a misunderstanding as to the location thereof, this had not been done. The water commissioners and their attorney stipulated that they would favor the enlargement of the district so as to correct this error. No further objections were offered.

After due study of the petition and its exhibits, the evidence and the arguments given at the hearing and the report of the Commission's engineers, it appears as follows:

Clover Street water district covers a portion of the town of Brighton, Monroe county, about one square mile in extent. It is situated immediately east of the former village of Brighton, now the twenty-first ward of the city of Rochester, and extends to the easterly boundary of the town. The main line of the New York Central & Hudson River railroad runs just inside the southwesterly boundary thereof. The district was formed by order of the town board of the town of Brighton at a meeting held on the 19th day of December, 1913. This meeting was called by the town clerk, as provided by law, to take action upon a taxpayers' petition for the formation of this district, dated September 25, 1913, and filed in the office of said clerk on December 8, 1913. At this meeting the town board appointed the petitioners in the present proceedings as commissioners of the district then formed. On December 26, 1913, these commissioners took the constitutional oath of office, filed the necessary bonds, entered into their duties as such commissioners and have so continued to the present time. According to the petition to this Commission, this district has a population of approximately 500, the assessed valuation of all taxable property therein, by the last assessment roll, is approximately $200,000 and the expenditure authorized by the town board for the construction of the proposed water-works system is $20,000.

Plans for the proposed water works system were prepared for submission to the town board by Mr. H. C. Kittredge, civil engineer. Copies of these plans and of the reports and estimates accompanying the same were attached to the petition to the Conservation Commission.

At present this district is without any public system of water supply. Water for domestic use is obtained from wells which yield an inadequate supply of poor quality, or from Irondequoit creek, which is contaminated and difficult of access. Practically no water for fire protection is available. During recent dry seasons serious inconvenience has been caused the inhabitants by the failure of wells and springs and crops have been lost or damaged by lack of water for sprinkling purposes. The development of the district for suburban residence purposes has been seriously retarded by lack of water.

The proposed source of supply for this district is the distribution system of the Rochester & Lake Ontario Water Company. No definite contract has as yet been entered into between the petitioners and the company, but the company has made a written offer to supply this district with not less than 25,000 nor more than 100,000 gallons of water per day, under pressures ranging from 40 to 80 pounds per square inch, for the sum of fifteen cents per thousand gallons. Water supplied by this company is pumped from Lake Ontario and is filtered. The pumping station is on the lake shore in the town of Greece, about one and one-half miles west of the mouth of the Genesee river. From this station a cast-iron intake pipe extends into the lake for a distance of 4,000 feet. Water is drawn through this intake, treated with coagulants and passed into a sedimentation basin, from which it is pumped through mechanical pressure filters into the distribution system. From the pumping station, the mains run in a southerly direction to the main line of the New York Central & Hudson River railroad, thence, following the right of way of this railroad, easterly through the city of Rochester and the town of Brighton, extending finally to the villages of Fairport and Pittsford. On Cobb Hill, near the southeasterly boundary of the city of Rochester, is situated a large standpipe connected with the mains of this company. This standpipe is about two miles from the center of the Clover Street water district. Water is supplied by the company to persons, railroads, manufacturing establishments and water districts in the towns of Greece, Gates, Chili, Brighton, Pittsford, Penfield, Perinton and Irondequoit and in the twenty-first ward of the city of Rochester. For its purposes, the source of supply used by this company is inexhaustible and any increase in the demands for water in the various districts supplied by it can readily be met by the installation of more pumping and filter units and the laying of additional mains.

Competent chemists control the operation of the filtration plant. Daily analyses of raw and filtered water are made and efficient operation secured. Analyses submitted with this and other petitions show that the quality of water supplied is suitable for all purposes, including drinking.

The works will cost, according to the estimate of the engineer, $18,223. The district is authorized to expend $20,000. This estimate appears to be reasonable.

The proposed works, if constructed in accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, will be safe. Pressures and size of piping are sufficient to afford sufficient water for all ordinary purposes and to give reasonable fire protection.

All piping is to be laid in public streets or roads and no land is to be taken or acquired for the construction of this system.

But three available sources of supply would ordinarily be considered for this district, namely: The system of the Rochester & Lake Ontario Water Company, the system of the city of Rochester and the waters of Irondequoit creek. Direct connection to the mains of either of the first two systems would give water under satisfactory pressure; the last named source would require pumping and careful filtration. Rochester has not more than enough water for its needs and the cost of the necessary connecting pipe line would be considerable. Water from Irondequoit creek would probably be more expensive and less satisfactory than that sold by the company. It therefore appears that the project now under consideration is the most satisfactory for the applicant.

The construction and operation of the proposed water works system will not adversely affect the present or future water supply interests of any other municipality or civil division of the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined or paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

And the Commission further determines that if the town board of the town of Brighton shall hereafter extend the boundaries of Clover Street water district to include the property adjacent to this district owned by Emil Laass and that known as the Curtis Estate, the above findings and determinations will apply to the district so enlarged.

Provided, however, that this application be granted subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans and specifications submitted.

2. After these works have been constructed they shall be inspected by

and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Water Commissioners of the Clover Street water district of the town of Brighton, county of Monroe.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed thereto and has filed the [L. S.] same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 29th day of January, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
JAMES W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 152

CITY OF MT. VERNON, Westchester county.

Application filed January 8, 1914.

Hearings held in Mt. Vernon, February 9, March 2, 6, 13, 21 and April 7, and in New York city April 24, 1914; additional proofs submitted July 23, 1914.

The city wishes to acquire by purchase or condemnation that portion of the distribution piping of the New York Interurban Water Company which is now operated within the limits of said city, or else to construct an entirely new distribution system in that city. In either case water is to be purchased from New York city through either a temporary connection at 242d street and White Plains road or from Hillview reservoir. Estimated cost, $1,200,000.

Objections were filed by the New York Interurban Water Company and by the Board of Water Supply of the City of New York.

A hearing has been had upon this application lasting for many days. Exhaustive study has been made of this project. No decision on this application has yet been formulated.

WATER SUPPLY APPLICATION NO. 153

VILLAGE OF SIDNEY.

Application filed January 30, 1914.

Hearings held in Albany, February 19, 26 and 27; March 24 and 25, April 9 and June 25, 1914.

The village wishes permission to acquire the right to use Guilford lake as a source of water supply and to construct an entirely new distribution and supply system of piping in the village. Estimated cost, $125,000.

Application opposed by Sidney Water Works Company, a corporation now supplying the village with water and by residents of Guilford village and others.

Extended hearings have been held, but the applicant has not yet filed all the necessary papers. Decision has been withheld awaiting receipt of all proof.

WATER SUPPLY APPLICATION NO. 154

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the VILLAGE OF CENTERVILLE STATION, Sullivan county, N. Y., for the approval of the maps, plans and profiles of the proposed water works system to supply the inhabitants of the said municipality.

Decision

Application filed February 6, 1914.
Hearing held in Albany, March 12, 1914.
Decision May 18, 1914.
Approved.

Isadore D. Wolf, Abe Cohen, Max Saphirstein, Harris Bresnick and Sholom Newmark, the trustees of the incorporated village of Centerville Station, on February 4, 1914, made an application to the Conservation Commission for approval of the project of the applicants for the acquisition of a source of water supply and the installation of a municipally owned water works system in the village of Centerville Station. This application was filed in the office of the Conservation Commission February 6, 1914. On April 14, 1914, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice, published in the *Republican Watchman* and *Sullivan County Republican* of Monticello, the *Liberty Register* and the *Liberty Gazette* of Liberty, a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 10 A. M., March 12, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioners appeared by Carpenter & Rosch, their attorneys, represented by the Hon. Joseph Rosch. Objections to the granting of this application were filed on behalf of J. H. Giles, Ira Winters, John Cypert and Gussie Levine, by Hon. George H. Smith, and on behalf of Arch B. Rosenstraus, by John D. Lyons, Esq. At the hearing all of the objectors were represented by Hon. George H. Smith.

It is proposed by the applicants to use as a source of supply for the village a body of water known as East pond, which lies about a mile north of the village limits and at an elevation 230 feet higher than the main street thereof. From this pond water is to be conducted through an intake crib and an 8-inch cast-iron pipe to the village. In the streets of the village a distribution system, consisting of 8-inch, 6-inch, and 4-inch diameter cast-iron pipes is to be laid. The whole system is to consist of 10,875 feet of 8-inch, 4,710 feet of 6-inch and 4,220 feet of 4-inch cast-iron pipe, a total of 19,805 feet, or about 3.75 miles of pipe. One crane-post hydrant and twenty-six double-nozzle fire hydrants are to be installed in the village streets. The whole system is to operate by gravity.

It is contended by the objectors that this proposed use of East pond will make it necessary to restrict the present use of the pond for boating, bathing and ice cutting and the use of the drainage area tributary thereto for building and other purposes. Further, it is now proposed to use East pond as a storage reservoir in connection with the projected hydro-electric development at Hackle dam on Neversink river. It is claimed that this proposed diversion of water and these inevitable sanitary restrictions will cause such damage to the owners of the pond, of the surrounding lands, of the water rights on the outlet thereof and those on Neversink river that the funds appropriated by the village will be insufficient to meet all demands for damages and construction costs. Therefore, the objectors contend that this project is not justified by public necessity and that due provision for the payment of damages has not been made.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

Centerville Station is a village in the easterly portion of Sullivan county. It was incorporated under the general village law on May 17, 1911. This village is located on the main line of the New York, Ontario & Western railroad and is situated on the divide between the Neversink and Rondout drainage areas. No enumeration of population has been made since incorporation, but the population is estimated at 750 in the winter and 1,500 in the summer. Real property within the village was assessed for $55,655 and personal property for $18,550, a total of $74,205 on the last roll. It is conceded that this assessed valuation is materially less than the real valuation of the property. As a village, Centerville Station has no bonded debt, but it forms part of a union school district, which has a small bonded indebtedness.

Centerville Station now has no public water supply system. Water for drinking and domestic purposes is obtained from ordinary wells about the houses and from a few springs. Water for fire protection is obtained from these same wells and in part from Woods lake. The quality of the water now used is poor and considerable quantities of bottled water are imported from Ellenville and other places. Fire protection is entirely inadequate and serious fire losses have occurred in the past. On account of lack of fire protection, great difficulty has been experienced in obtaining insurance on village property; such small amounts of insurance as have been obtained have required payment of excessively heavy premiums. As there is no public sewerage system in the village the local wells are probably contaminated. It is evident that great need exists for a public water supply system.

On September 8, 1913, at a meeting of the board of trustees of Centerville Station, a special election was called to vote upon the proposition of issuing village bonds in the amount of $35,000 for the purpose of constructing a water supply system. This election was duly held on September 30, 1913, and the proposition was carried in the affirmative by a large majority.

After careful investigation of possible sources of supply in the neighborhood, the project now under consideration was adopted.

Plans and estimates for the proposed system were prepared by Charles H. Smith, civil engineer, of Middletown. General plans, reports and estimates were submitted with this application.

East pond is a natural body of water; it has an area of 100 acres and a tributary watershed of about one-third of a square mile. It seems certain that this pond will yield water sufficient for the needs of Centerville Station for many years to come. The required yield has been estimated at 60 gallons per capita per day. This is equivalent to from 50,000 to 100,000 gallons per day, according to the season of the year.

The watershed of East pond is uninhabited and is completely covered with second growth timber. Except for a few boat houses along the shore and a bathing pavilion near the upper end of the pond, there are no buildings on the watershed. East pond is now used to some extent for boating, fishing, bathing and the cutting of ice. Analyses submitted with the application indicate that on October 17, 1913, the water from this pond was of satisfactory quality for drinking purposes. As the various uses of this pond undoubtedly cause pollution of the water, this Commission will require that bathing, ice cutting and boating be prohibited, or else carried on under satisfactory restrictions. Before any water is drawn from this pond for domestic use in the village, it will be required that suitable rules for the sanitary protection of the watershed and the waters of this pond shall be enacted by the State Department of Health. If protected by suitable sanitary restrictions the quality of this water will be such as not to require filtration at the present time. A filter can readily be added to the system when needed; connections for this purpose are to be placed in the supply pipe line.

The village engineer estimates that the proposed works will cost $31,801.25. It appears probable that this system can be constructed at a cost not exceeding $35,000, the amount available for the purpose.

Detailed plans and specifications for the proposed system have not been filed, but the applicants have stipulated that these will be submitted when required and that no works will be constructed except in accordance with plans and specifications which have been approved by this Commission. General plans filed with the petition indicate that the system will supply water in amounts and under pressures sufficient for domestic purposes and for fair fire protection.

It will be required that a meter be installed upon the main supply line and that accurate record be kept of the quantity of water drawn from the pond for village purposes. It will further be required that this amount be limited to 30,000,000 gallons in any one year until such time as the Conservation Commission shall permit of greater draft.

Lands and rights of way are to be acquired for the intake and supply main to the village; the remainder of the piping is to be laid in public streets and roads.

But one alternative source of supply appears to be available. This is Woods lake, which lies east of and partly within the village limits. This lake is larger that East pond, has a drainage area of several square miles and therefore would be capable of yielding a greater supply of water. This water would have to be pumped, as the lake is some 75 feet lower than the village. As the lake receives the natural drainage of the entire area of the village, water from it would be highly contaminated and thorough filtration would be necessary. It is probable that East pond is the most favorable source of water supply available.

The diversion of water from East pond for the supply of the village of Centerville Station will not injuriously affect the water supply interests of any other community in the State. Fallsburgh, a small hamlet west of this pond, may in the future desire to obtain a supply of water therefrom, but water in sufficient quantity for the needs of both these communities is available from East pond.

Sanitary restrictions will be necessary to protect the purity of water of this pond and whatever damage these restrictions may cause must be paid by the village. The use of this pond as a storage reservoir for hydro-electric power will not militate against its use as a source of water supply for the village, but its value for such storage purposes will be lessened by the amount of the diversion to the village during the depletion period; this diversion will be complete, as the natural drainage of the village is into the Rondout drainage system. Such damage as may be caused in this manner must also be paid by the village. If the amount of these damages is disputed, the amount thereof must be determined by another tribunal.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. Before any contracts are let or work started on the construction of this system, detailed plans and specifications therefor must be submitted to the Conservation Commission; all the work must be completely constructed in accordance with plans and specifications which have received the approval of this Commission.

3. Before any water is drawn from East pond, the enactment by the State Department of Health of suitable rules for the sanitary protection of the watershed and the waters of this pond from contamination must be procured and thereafter the village authorities must rigorously enforce these rules.

4. The amount of water which may be drawn from East pond by the village of Centerville Station shall not exceed 30,000,000 gallons in any one year unless the consent of the Conservation Commission to a greater draft shall have been applied for and obtained.

5. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Trustees of the village of Centerville Station as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 18th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 155

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Petition of the VILLAGE OF FRANKLIN for the approval of its plans for the acquiring of an additional water supply.
} *Decision*

Application filed February 13, 1914.
Hearing held at Albany, March 11, 1914.
Decision May 18, 1914.
Approved.

Bernard Manzer, Orlo T. Foote and Fred C. Potter, trustees of the incorporated village of Franklin, Delaware county, on the 2d day of February, 1914, made application to the Conservation Commission for its approval of the project of the applicants for the acquisition of an additional source of water supply for the said village. This application was filed in the office of the Conservation Commission February 13, 1914. The Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers on April 15, 1914.

After due notice published in the *Delaware County Dairyman* of Franklin and the *Sidney Record* of Sidney a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 10 A. M., March 11, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project as shown by the minutes. The petitioners were represented by Hon. Edwin A. Mackey, their attorney. No objections to this project were filed and no one appeared in opposition thereto.

As an additional source of water supply for this village it is proposed to take or acquire certain springs on the farm of James Brundage, about one-half mile northeast of the northerly village limit. The structures necessary for the utilization of the water from these springs are now substantially completed. A collecting trench runs near to and west of the various springs and leads the water from them to a collecting basin. This trench is curbed with a dry rubble wall on the easterly side and with a concrete wall on the other side. This latter wall is intended to prevent ordinary surface water from entering the trench. The top of the trench is to be covered with bluestone slabs. The collecting basin is 8 feet by 22 feet in plan and 6 feet deep, constructed of concrete, and is to be covered with a wooden roof. Water will stand in it to a depth of 3 feet. Near the collecting basin a wooden pumping station has been built and equipped with a 3½-inch by 4-inch triplex plunger pump, direct connected to a 6 horse-power gasoline engine. Water is pumped from the collecting basin through 3,762 feet of 2-inch galvanized iron pipe to the existing distribution reservoir. This pump operates against a static head of 265 feet and has a capacity of 40 gallons per minute.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of its engineers, it appears as follows:

Franklin is a village in Delaware county, incorporated in 1836. It is on the left bank of Ouleout creek, which stream joins the Susquehanna river at Unadilla. Franklin at the present time has a population of 500 and an assessed valuation of $250,200. Bonds in the sum of $19,000 were formerly issued by the village for the construction of a public water supply system, of which bond issue the amount of $16,000 is still outstanding. The village has no other bonded indebtedness.

Franklin has owned and operated a municipal water supply system since 1889. This system obtains its water from certain springs located on high ground on the westerly side of the valley, from which water flows by gravity to the distribution system and through it to a distribution reservoir situated on a hill east of the village. This reservoir is covered, has a capacity of 224,000 gallons and is divided into two basins. It is at an elevation such as to give pressures of about 90 pounds per square inch on the 20 fire hydrants in the village.

During the drier portions of the past few years the yield from the present source of supply has been insufficient. By stringent restriction of the use of water and the universal use of meters the village usually has been able to get through the summer without emptying one of the reservoir basins. During the summer of 1913 the shortage of water was so complete that the reservoir was emptied entirely and for a time no water was available for fire protection. To relieve this serious condition the trustees of the village made diligent search for an additional source of water supply and selected that for which application is now made.

On the 11th day of September, 1913, at a special meeting of the board of trustees a call was issued for a special election to be held on September 24, 1913, to vote upon the proposition of selling bonds for $2,000 for the purpose of constructing additions to the water supply system. This election was duly held and the proposition was carried in the affirmative by a large majority. Most urgent need for additional water existed. Construction was started immediately and practically completed near the end of October, when the drought was broken and the yield from the old sources again became sufficient.

Brundage springs have never been accurately gaged, but during the driest period of the past summer the flow therefrom was estimated at 70,000 gallons per day. It appears to be certain that the yield from these springs will afford a material increase in the supply of water available for this village.

Analyses submitted with the application indicate that the water from these springs is moderately soft and of suitable quality for domestic uses. The springs issue from the foot of a steep bank which forms the easterly boundary of the flood plain of Ouleout creek. The topography of the site is such that direct drainage from neighboring farm houses cannot enter the springs themselves and it appears that during dry periods there will be no danger of direct contamination of water from these springs. This will not be the case during wet periods. During heavy rains and when Ouleout creek is in flood surface water can enter these works and this water will undoubtedly be contaminated. It will be required that these additional water supply works shall be used during dry periods only. It will be required that before pumping from this source after a period of non-use the collecting trench and basin be sterilized by the addition of a small quantity of chlorinated lime (bleaching powder).

The total cost of the works and the necessary lands and rights of way will be somewhat less than $2,000.

The works, if properly constructed of suitable materials and with careful workmanship, will be safe.

Thirty-six hundredths of an acre of land has been purchased from James Brundage. This parcel includes the sites of collecting works, pumping station and springs. In addition rights of way for the force main have been purchased from James Brundage, Sherrill Edwards and George Pomeroy.

It does not appear that the acquisition of this additional source of water supply by the village of Franklin will in any way affect the water supply interests of any other municipality or civil division of the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.
2. No water shall be pumped from this source at a time when surface drainage or water of Ouleout creek can enter the collecting trench or basin; nor thereafter until such trench and basin have been properly sterilized.
3. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Trustees of the incorporated village of Franklin as thus modified.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the [L. S.] same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 18th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 156

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the VILLAGE OF FRANKLINVILLE for approval of its plans for an additional source of water supply.
Decision

Application filed February 16, 1914.
Hearing held in Albany, March 11, 1914.
Decision May 18, 1914.
Approved.

On February 16, 1914, the village of Franklinville filed with the Conservation Commission an application for approval of the project of that village for the acquisition of an additional source of water supply. This petition was verified by William W. Waring, village president, on February 9, 1914. On April 28, 1914, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice published in the Olean *Herald* and the *Chronicle Journal* of Franklinville a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 2 P. M., on the 11th day of March, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project as shown by the minutes. The petitioner was represented by William W. Waring, village president. No objections were filed and no one appeared in opposition.

It is proposed to use as an additional source of water supply for this village four driven wells sunk in the valley of Ischua creek. These wells have been driven at a point 500 feet north of the village limits. They are situated on the corners of a rectangle 20 feet by 25 feet. Each well was formed by driving a 10-inch casing through 15 feet of gravelly loam and 8 feet of water bearing gravel to a bed of clay. An 8-inch casing, the lower end of which was slotted to admit water, was then lowered inside of the 10-inch casing, the larger casing drawn up out of the gravel bed and the space between the two tightly packed in order to exclude surface water. Water stands in these wells at a level 4 feet below the surface of the ground.

Water is to be pumped from these wells by two triplex plunger pumps, each of 400 gallons per minute capacity and each directly connected to a 35 horse-power electric motor. Suction piping between wells and pumps and the discharge piping is so arranged that these pumps can be operated singly or together. Electric power is to be purchased from the Cattaraugus County Lighting Company at three cents per kilowatt hour. A pumping station is to be erected over the pumps and motors. This structure is to be of brick, 32′ 10″ by 26′ 00″ in plan and is to have a slate roof supported by steel trusses. Twenty-five hundred feet of 8-inch cast-iron pipe line are to be laid from the pumping station southerly on North Main street to join an existing 6-inch main at the corner of North Academy street. Water is to be pumped directly from the wells to the distribution piping without purification.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

Franklinville is a village in Cattaraugus county, incorporated in 1874. It is situated in the valley of Ischua creek in the easterly portion of the county and is on the Olean-Buffalo division of the Pennsylvania railroad. According to the census of 1910 the population of this village was 1,568; it is now estimated at 2,000. By the last roll the assessed valuation of taxable property within the village limits was $805,928. Franklinville has an outstanding bonded indebtedness of $50,000 for sewerage construction and $500 for its fire hall.

In 1890 this village constructed a municipal water supply system at a cost of $32,000. This system originally supplied spring water to the village by gravity. Originally water was drawn from a group of springs 1½ miles northeast and another group 6 miles southeast of the village limits. These springs are respectively 219 and 384 feet higher than the general level of the village. Each group of springs is connected to the distribution system by a line of 4-inch diameter wooden pipe. These pipes were manufactured by the Michigan Pipe Company and consist of bored logs banded with strap iron and painted with coal tar. In the village a distribution system was installed composed of 8-inch, 6-inch and 4-inch diameter cast-iron pipes; 45 fire hydrants were installed for purposes of fire protection. Northeast of the village in the direction of the first group of springs a distribution reservoir was constructed. This basin, formed partly by excavation and partly by earth embankment, is 72 feet square on the bottom, 100 feet square on the top, 13 feet deep, holds over 700,000 gallons and is so situated as to give an average pressure on the system of 75 pounds per square inch.

It is stated that the maximum yield from these springs has not exceeded 180,000 gallons per day and that this usually falls to 100,000 gallons per day during the summer and has fallen as low as 75,000 gallons per day, which quantity is entirely insufficient for the needs of the village. On account of the shortage in the spring supply, water has been purchased from the Cattaraugus County Lighting Company. This water is pumped by the company from a driven well near its power house and is sold to the village at a cost of 5 cents per thousand gallons. This well is situated in the heart of the manufacturing district, is 6 inches in diameter and 23 feet deep; the maximum yield therefrom has been about 100,000 gallons per day. As the amount of water required by the inhabitants of this village is between 200,000 and 300,000 gallons per day, water is not always available, even when this well is being pumped to its maximum capacity. During 1913 water was pumped for nine months and even so the reservoir has been partly empty since July of that year. At the time of the hearing it was completely empty. Recently a sewerage system has been built and the population has increased by 400 persons in the last two years, causing many new houses to be constructed and a large increase in the demand for water. It is evident that the necessities of this village require that additional water be obtained immediately.

At a special meeting held August 23, 1913, the board of trustees of the village of Franklinville called a special election to vote on the proposition of bonding the village for $10,000, in order to carry out the project now under consideration. This special election was duly held on September 9, 1913, and the proposition carried in the affirmative by a large majority.

The wells were sunk by the United Engineering and Construction Company, Inc., of Cleveland, Ohio, and the plans for the proposed construction were prepared by this company and submitted to this Commission with the application.

The wells which form the proposed additional source of supply are sunk in the alluvial deposits forming the bottom lands of the valley of Ischua creek. The valley at this point is from 1 to 1½ miles in width and the ground surface at the wells is sufficiently high to be above the flood level. It is stated that this alluvial deposit is composed of from 12 to 15 feet of gravelly loam, overlying a stratum of water bearing gravel from 8 to 10 feet in thickness, under which is a clay bed which overlies an unknown depth of quicksand. After the completion of each well water was pumped from it continuously for twenty-four hours at a rate of 150 gallons per minute. This pumping had little or no effect on the neighboring wells and the water in them rose to its original position as soon as the pump was stopped. It is not possible accurately to estimate the available yield of these wells from such short time tests, but it appears that there is an enormous body of ground water in the alluvial deposits of this valley and that undoubtedly these wells will afford a considerable additional quantity of water.

Analyses of water taken from a 2-inch driven well in the immediate vicinity of the village wells were submitted with the application. They indicate that the water is slightly hard and somewhat turbid, but that otherwise its chemical and bacteriological condition is satisfactory. It is probable that continued pumping will reduce the turbidity in some measure. The lands immediately around the wells are used for farming purposes. Originally this tract formed a portion of the local fair grounds, but the fair has now been abandoned and it is improbable that the grounds will again be used for this purpose. As there is no inhabited building within 1,000 feet of the wells, there seems no danger of contamination of this ground water at the present time. The present growth of the village is in this direction and there is a possibility that building operations may be extended to the immediate vicinity of these wells. If this should happen, grave danger of contamination would exist and it would probably be necessary either to install a system of purification or to abandon the wells and to move the equipment to another location. For the present water from these wells can safely be used without purification.

It is estimated that all the works proposed in connection with the wells, pumping station, pumps, motors and connecting main can be constructed for an amount not exceeding the available appropriation.

To avoid dangerous water-hammer effects the electric motors to be installed in the pumping station must be so arranged that they can be both started and stopped with gradual changes in speed. Standard pipe coating must be used on all bell and spigot cast-iron pipe. Otherwise the works, if constructed in accordance with plans and specifications submitted, of suitable materials and with careful workmanship, will be safe and adequate for the purpose for which designed.

One acre of land surrounding the wells and sufficient in extent for the installation of the pumping station has been purchased by the village.

Alternative sources of supply exist and have been studied by the village authorities. It does not appear that any of these offer material advantages over that which it is proposed to use.

The pumping of water from these wells by the village of Franklinville will not in any way affect the water supply interests of any other community in the State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That the said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. Specifications for cast-iron bell and spigot pipe shall be modified to require that the pipe shall be coated in the usual manner, as specified in the standard specifications of the American Water Works Association, or of the New England Water Works Association, instead of requiring that they be painted with parraffin paint as in the specifications submitted.

3. The land owned by the village shall be tightly fenced and no animals shall be kept or pastured within the enclosure. No dwelling houses shall be permitted to be erected upon this land.

4. If at any time analyses of the water from these wells show that it has become contaminated, or if buildings shall be constructed so near to the wells as in the opinion of this Commission or of the State Department of Health to cause danger of contamination of the water therefrom, the village shall immediately abandon this source of supply, or else install such purification or sterilization works as shall meet the approval of this Commission.

5. Electric motors and accessory controlling devices must be of a type satisfactory to this Commission and must be such as to allow the pumps

to be started and stopped with gradually changing rates of speed, such as not to produce dangerous water-hammer effects.

6. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the village of Franklinville as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 18th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 157

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the incorporated VILLAGE OF MORRIS of the town of Morris, county of Otsego, State of New York, for additional water supply.
} *Decision*

Application filed February 24, 1914.
Hearing held at Albany, March 12, 1914.
Decision April 1, 1914.
Approved.

Burton D. Phillips, Albert C. Smith and Vinton L. Curtis, the water commissioners of the village of Morris, acting on behalf of that village, on February 21, 1914, made application to the Conservation Commission for its approval of plans for an additional water supply for that village. This application was filed in the office of the Conservation Commission February 24, 1914.

After due notice, published in the Oneonta *Press* and the Morris *Chronicle*, a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 2 P. M., March 12, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners were represented by Merritt Bridges, Esq., village attorney. No objections were filed and no one appeared in opposition.

The project for which approval is desired is the making available of an additional supply of water for the village of Morris from Calhoun brook, the present source of supply. The present intake is to be abandoned and the present supply main continued upstream about one-quarter of a mile. At this point a storage reservoir, aerator and filter plant are to be installed. In addition, the existing distribution reservoir is to be repaired and reinforced. No additional distribution works are to be constructed.

The proposed storage reservoir is to have a tributary watershed of 2.82 square miles, is to cover an area of 4.3 acres and have a capacity of 6,462,000 gallons. It is to be formed by the construction of an earth dam with a concrete core wall and paved spillway channel. This dam is to be 200 feet long on top, to have a maximum height above the existing surface of 18 feet, is to be 10 feet wide on top and to have 1:2 slopes. This dam is to be composed of earth, rolled in layers, and is to have a concrete core wall, founded on rock. The upstream slope is to be covered with heavy rip-rap. An overfall is to be provided with a crest 34 feet long and 6 feet lower than the top of the dam. This spillway is to be entirely in excavation and the core wall is to be continued across it, forming a concrete sill, to prevent erosion. The overfall channel is to be paved with concrete. Where necessary the reservoir is to be excavated to give a depth of not less than 8 feet with water at the level of the spillway crest. A 14-inch cast-iron blow-off pipe and an 8-inch cast-iron supply main are to pass through the dam; these pipes are to be provided with concrete collars and the flow through them is to be regulated by gate valves below the dam.

For the removal of tastes and odors, due to algae and other causes, an aerator is to be provided, consisting of a concrete basin 17 feet in diameter, in the center of which six vertical vaned one-half inch nozzles are to be placed, equally spaced on a three foot circle. This structure is to be placed immediately below the dam, is to receive water from the reservoir through an 8-inch pipe and is to be provided with overflow and clean-out pipes. It is to be directly connected with the filter. A slow sand filter is to be provided for the purification of the water drawn from this reservoir. This filter is to be built of reinforced concrete and to be roofed with the same material. It is composed of a single bed 33 feet square in plan, containing 3 feet of sand and 1 foot of gravel. Automatic valves are provided to regulate the passage of water. Water is to be conducted through the existing supply main, as extended, from the filter to the existing distribution reservoir. Provision is made for by-passing both aerator and filter if necessary.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing, and the report of its engineers, it appears as follows:

Morris is a village in the southwesterly part of Otsego county, situated in the valley of Butternut creek, a branch of Unadilla river, in the Susquehanna river watershed. This village was incorporated in 1870. At the present time Morris has a population of 535, an assessed valuation of $111,980 and a bonded indebtedness on account of water works of $7,500.

Since 1895 Morris has had a public water supply system, which has cost up to the present time $14,500. This system was designed to supply the village by gravity with water drawn from Calhoun brook, a stream flowing in a southerly direction through the village into Butternut creek. At a point 1¼ miles northwest of the village water is diverted from this creek by a small intercepting dam and, after passing through a crude filter, consisting of an underdrained bed of gravel, flows through 3,000 feet of 6-inch cast-iron pipe to a distribution reservoir. This latter structure is 78 feet by 18 feet in plan, 9.4 feet deep and has a capacity of about 94,500 gallons. It is formed by earth embankments, lined with masonry and covered with a wooden roof. The flow line of this reservoir is 64 feet lower than the diverting dam and 155 feet higher than the ground surface in the lower portion of the village. This reservoir is connected by 4,450 feet of 8-inch cast-iron pipe to the village distribution system, composed of 3 miles of cast-iron pipe, 6 inches and 4 inches in diameter, and about 24 hydrants. During the greater portion of the year the present system yields sufficient water for the needs of the village. In recent periods of extreme drought the flow of Calhoun brook has fallen as low as 28,000 gallons per day, which has been insufficient to meet the demands of the inhabitants of Morris and, in order to prevent the depletion of the distribution reservoir and consequent loss of fire protection, the village authorities have installed an emergency pumping outfit to take water from Butternut creek and force it into the existing mains. This emergency plant consists of a gasoline engine driven triplex plunger pump.

According to analyses submitted with the application, the unpurified water of Calhoun brook does not appear to be satisfactory for domestic use. The bacterial count has been high and substantially no reduction has been observed after passage through the existing crude filter. As there are over twenty buildings upon the watershed, at least two of which are near the stream, it is feared that this high bacterial count may indicate contamination of a dangerous character. The waters of Butternut creek are contaminated with sewage and are entirely unfit for domestic use without careful filtration.

On account of the deficiency in quantity of water supplied by the present works, the doubtful quality of the water from Calhoun brook, and the unsuitability of the water from Butternut creek, the water commissioners desire to install the present works in order that the village may be provided with an ample supply of pure and wholesome water.

The plans for the proposed new works were prepared by Vrooman & Perry, civil engineers, of Amsterdam, N. Y., and accepted by the village authorities.

To meet the cost of these works a bond issue of $6,000 was authorized by an affirmative vote at a special election held upon the 6th day of August, 1913, pursuant to resolution of the village board, duly adopted at a meeting held July 23, 1913. This amount will not pay for the proposed additions, which are estimated to cost $22,754.12, but a generous summer resident of this village has undertaken personally to contribute the necessary funds to complete the works.

As above stated, water is to be obtained from Calhoun brook at a point about 1½ miles north of the village. At this point the tributary watershed is 2.82 square miles and the proposed storage about 6,500,000 gallons. It is estimated that with this development a dependable yield of 120,000 gallons per day can be obtained. Without purification the sanitary quality of this water is not satisfactory, but, with proper operation of the proposed aerator and sand filter and with the further protection afforded by the State Department of Health rules for the sanitary regulation of this watershed, it appears that water of entirely satisfactory quality can be obtained at this point.

The proposed works, if properly constructed in acordance with plans and specifications submitted, of suitable materials and with satisfactory workmanship, will be safe and suitable for the purposes for which designed. In order that the operation of the filters can be adequately controlled and a record of the water consumption of the village kept to check waste and give valuable information when future alterations of extensions of the water works system become necessary, the installation of a satisfactory type of meter, or some other form of measuring device, will be required.

Eleven acres of land are to be taken for the construction of the proposed storage reservoir and additional lands or rights of way must be acquired for the extension of the supply main.

Alternative sources of supply exist, but none of them appear to be more advantageous than that now proposed to be used. Some of them possibly could be utilized at a later date as additional sources of supply.

It does not appear that the taking of this additional quantity of water, or of all the water that may be taken from this particular catchment area, will in any way adversely affect the water supply interests of any other municipality or civil division of the State.

As the proposed new reservoir is to be constructed upstream from the present intake, danger of contamination of the water supply of this village will exist during the construction period. It will therefore be necessary for the village to take great precautions during this period in order that the purity of this supply of water may be preserved. Some provision is made for this in the specifications, but in addition it will be required that the State Department of Health be asked to give its advice and assistance, and it will also be required that the proposed method of guarding the purity of this water be stated in detail to this Commission and approved by it. It is recommended that at the earliest possible moment the supply conduit be extended upstream to a temporary intake at a point above the proposed dam.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That the said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.
2. After the completion of these works, all water supplied to the distribution system of the village of Morris shall be filtered in a manner satisfactory to this Commission.
3. A meter of approved type, or some other device, for measuring the flow of water of a type satisfactory to this Commission shall be installed on the supply pipe line near the filter.
4. The proposed method of protecting the purity of the water supply of this village during the construction period shall be submitted to and approved by the State Department of Health and this Commission before work is begun.
5. Before the completion of the works, application shall be made to the State Department of Health for the enactment of rules for the sanitary protection of the watershed above the proposed dam, and thereafter the village shall rigorously enforce the provisions of such rules as may be enacted.
6. After these works have been constructed, they shall be inspected by and be subject to the approval of this Commission, and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the board of water commissioners of the village of Morris as thus modified.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the [L. S.] same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 1st day of April, 1914.

CONSERVATION COMMISSION.
GEORGE E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 158

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the VILLAGE OF ARKPORT, Steuben county, N. Y., for approval of its plans for the acquisition of a new water supply.
} *Decision*

Application filed March 11, 1914.
Hearing held at Albany April 16, 1914.
Decision May 18, 1914.
Approved.

William M. Hurlbut, J. Warren Wallace and Clair A. Higgins, trustees of the village of Arkport, on March 9, 1914, made application to the Conservation Commission for its approval of the plans of said village for the acquisition of a source of water supply and the construction of a water works system. This application was filed in the office of the Conservation Commission March 11, 1914. On April 27, 1914, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice published in the *Evening Tribune Times* of Hornell, a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 10 A. M. April 16, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project as shown by the minutes. The petitioners were represented by Harry L. Allen, Esq., attorney for the village. No objections were filed and no one appeared in opposition.

It is proposed to utilize the waters of Lime Kiln creek as a source of supply for this village. At a point one-quarter of a mile northeast of the village boundary a diverting dam is to be constructed on this stream. This dam is to be of concrete, thirty-six feet long and from two to five feet high and is to have a cut-off wall of wooden sheet piling. Above the dam a screened intake is to be installed and connected by 650 feet of 6-inch diameter cast-iron pipe to a distribution reservoir. The reservoir is to be of reinforced concrete, circular in plan, seventy feet in diameter and ten feet deep with a capacity of 300,000 gallons. The reservoir and distribution piping are to be connected by a line of 10-inch diameter cast-iron pipe. Ten-inch, 8-inch, 6-inch and 4-inch diameter cast-iron pipes are to be laid in the various streets of the village, forming a distribution system which is to contain two miles of pipe, seventeen gate valves and thirty-eight hydrants. This system is to operate entirely by gravity. As the flow into the distribution reservoir is to be regulated by an automatic valve, the whole system will operate with little supervision. No purification works are to be provided.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

Arkport is a village near the westerly boundary of Steuben county, located in the valley of Canisteo river and on the Hornell-Buffalo division of the Erie railroad and on the Pittsburg, Shawmut & Northern railroad. This village was incorporated in 1913 and at that time had an estimated population of 580 persons. By the last roll the assessed valuation of taxable property within the village was $197,210. As a village, Arkport has no bonded debt.

Arkport is now entirely without a public system of water supply and entirely without any fire protection. Water for domestic purposes is obtained from shallow wells and is of unsatisfactory quality. Several fires have occurred in the past and have caused heavy loss, which might have been obviated had a suitable water supply system been installed. It is evident that public necessity exists for a water supply system in this village.

At a regular meeting of the board of trustees, held December 27, 1913, a special election was called to vote upon the proposition of issuing bonds for the amount of $18,000 for the purpose of constructing these proposed works. This election was duly held on January 10, 1914, and the proposition carried in the affirmative by a large majority. On March 7, 1914, by resolution duly adopted, the board of trustees authorized the making of this petition to the Conservation Commission.

Charles C. Hopkins of Rochester was engaged by the board of trustees as its engineer and directed to find a source of water supply for this village and prepare the necessary plans, specifications, reports and estimates. The present project was recommended by Mr. Hopkins and accepted by the village.

Lime Kiln creek rises northeast of the village in the direction of Dansville and flows in a southwesterly direction through the village limits into Canisteo river. At the proposed point of diversion this stream has a watershed of five square miles. Rough gagings of the flow at this point made in June and in October, 1913, indicated that the run-off at that time of extreme drought was between 600,000 and 800,000 gallons per day. As it is estimated that for many years to come the demands of the village will not exceed 90,000 gallons per day, it would appear that Lime Kiln creek would be able to furnish ample water for the needs of this community without the installation of a storage reservoir.

Above the point of diversion the watershed of this creek is composed of deep steep-sided valleys, partly wooded and partly farming and grazing country. There are no villages on the watershed and probably not more than twenty-four houses. Most of the inhabited buildings are somewhat removed from the stream and it is probable that the protection afforded by the enactment by the State Department of Health of suitable rules for the sanitary protection of this watershed and the rigorous enforcement of such rules will afford such protection as to make safe the use of this water without purification. The enactment of such rules will be required by this Commission.

In view of the fact that practically no storage is to be had, the village is advised to install some form of filtration plant at the earliest date permitted by the village finances.

It has been estimated that these works can be constructed for $18,000. In view of the low price now prevailing for cast-iron pipe, it is probable that this appropriation will not be exceeded.

The works, if properly constructed in accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, will be safe and will give an adequate supply of water for the domestic needs of the inhabitants of Arkport. Pipe sizes, pressures and size of reservoir are such as to afford fair fire protection. This protection would be entirely adequate, except that some hydrants are installed on 4-inch pipe lines in which the friction losses will be so great as to reduce the pressures below really satisfactory amounts.

For the purpose of installing this system, land is to be taken for the intercepting dam, the pipe line to the reservoir and the reservoir itself; the remainder of the piping is to be laid in public streets and roads.

No alternative source of supply, offering superior advantages to Lime Kiln creek, has been discovered.

The taking of water from this creek by the village of Arkport will not adversely affect the present water supply interests of any other community in the State. In 1898 the city of Hornell contemplated the use of this stream as a source of water supply for that city. Plans were prepared and a large quantity of land along the bed of the creek was purchased and water rights acquired. Shortly thereafter the city purchased the private plant which was then supplying its inhabitants with water and since that time has been developing these other sources of supply, so that the Lime Kiln creek project has been abandoned for the present. If the growth of Hornell should be such as to exceed the yield of its present source, that city might desire to develop Lime Kiln creek as a source of supply. In view of this fact, the amount of water which may be taken from this stream by the village of Arkport will be limited to the amount which will adequately satisfy the necessities of that community, and it will be required that a meter be installed on the supply line below the reservoir to record the amount of water used and that this amount shall not exceed 20,000,000 gallons in any one year. This limit on the draft may at a later date, upon application of the village and due cause shown, be increased by this Commission.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. Before any water is drawn from Lime Kiln creek and furnished to the inhabitants of Arkport, the enactment by the State Department of Health of suitable rules for the sanitary protection of the watershed of that stream and the waters thereof from contamination must be procured and thereafter the village authorities must rigorously enforce these rules.

3. On the supply main between the reservoir and the village a satisfactory meter must be installed and an accurate record kept of the amount of water supplied to this village. The amount of water withdrawn from Lime Kiln creek for the purpose of supplying the people of Arkport shall not, without further consent and approval of the Conservation Commission, exceed the amount of 20,000,000 gallons in any one year.

4. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the village of Arkport as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 18th day of May, 1914.

CONSERVATION COMMISSION.
GEORGE E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 159

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application of the SEA BREEZE WATER DISTRICT in the town of Irondequoit, for approval of its plans for a new water system. } *Decision*

Application filed April 6, 1914.
Hearing held at Rochester April 29, 1914.
Decision May 19, 1914.
Approved.

A. Elbert Allen, Arthur L. Case and Cornelius E. deJonge, the water commissioners for the Sea Breeze water district, on April 3, 1914, made application to the Conservation Commission for its approval of the project of the applicants for the installation of a water supply system in said water district and for the purchase of water therefor from the mains of the Rochester and Lake Ontario Water Company. This application was filed in the office of the Commission April 6, 1914.

After due notice published in the *Union and Advertiser* and the *Rochester Herald* of Rochester a hearing was held on this petition in the Monroe County Court House in the city of Rochester at 10 A. M., April 29, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners were represented by Arthur T. Pammenter, Esq., their attorney. No objections to the granting of the approval of this project were filed.

It is proposed to install in Sea Breeze water district a complete water supply system, consisting of 16,450 feet of 6-inch and 16,020 feet of 4-inch cast-iron pipe. Water for this system is to be obtained from the mains of the Rochester and Lake Ontario Water Company at the intersection of Sea Breeze and Ridge roads. This water will be furnished under such heads as to give pressures of from 85 to 100 pounds per square inch on the proposed system. Thirty-seven double-nozzle fire hydrants are to be connected to this system for the purpose of fire protection.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

Sea Breeze water district was formed by an order of the town board of the town of Irondequoit, Monroe county, dated March 30, 1914. At this meeting the said town board took action upon a petition for the formation of such district, signed by a majority of the owners of taxable real property therein and acknowledged in the manner of a deed to be recorded; which petition was filed with the town clerk of said town of Irondequoit March 17, 1914. At said meeting the petitioners in this proceeding were duly appointed water commissioners of said district and thereafter duly qualified for office and filed the necessary bonds.

Sea Breeze water district is situated in the northeasterly corner of Irondequoit township, east of Durand Eastman park, that portion of the city of Rochester which lies along the shore of Lake Ontario. According to the petition this district has a population of about 500 persons in the winter and 4,000 in the summer. The transient population on certain days in the summer is from 10,000 to 50,000. By the last roll the assessed valuation of taxable real property within the district was $330,000. The amount authorized to be expended upon the proposed water supply system is $25,000.

Sea Breeze water district at the present time has no public system of water supply. Water for domestic purposes is obtained from shallow wells in the immediate neighborhood of the houses. This supply is limited in quantity and probably of doubtful sanitary quality. At present the district is entirely without fire protection. It is evident that need exists for the installation of a water supply system within this district.

Detailed plans, estimates, reports and specifications for the proposed construction were prepared for submission to the town board by Mr. H. C. Kittredge, a civil engineer of Rochester. Copies of these plans and papers were submitted with the application to the Conservation Commission.

It is proposed to obtain water for this system from the mains of the Rochester and Lake Ontario Water Company. This company pumps water from Lake Ontario at a point west of the village of Charlotte. This water, after passing through a battery of mechanical pressure filters, flows under pressure in a southerly direction to the main line of the New York Central and Hudson River Railroad, from thence along the line of this railroad in an easterly direction through the city of Rochester to a standpipe situated on Cobb hill. From thence the water flows by gravity in a northerly direction through a portion of the city of Rochester into the township of Irondequoit. The company installed these extensions of its mains in Irondequoit township pursuant to authority granted to it by this Commission on July 3, 1912. This company has undertaken to supply the water district with water at the wholesale rate of fifteen cents per thousand gallons. All of this water is to be measured by a meter and the amount is to be not less than 25,000 nor more than 100,000 gallons per day computed on a yearly basis.

Water supplied by this company is of suitable quality for domestic purposes, including drinking. Capacities of pumps, filters and mains are sufficient to supply the needs of the people of this district without depriving other customers of the company of the water necessary for their use and comfort.

It is estimated that these works can be constructed for a sum not exceeding the appropriation of $25,000. This estimate appears to be reasonable, particularly in view of the present low prices obtainable on cast-iron pipe.

The works, if properly constructed in accordance with these plans and specifications, of suitable materials and satisfactory workmanship, will be safe and adequate for the purposes for which designed. It appears, however, that the pressures under which a considerable portion of this system will be operated are higher than is usual in such installations and are such as to necessitate the use of pressure reducing valves upon the majority of house connections. It would be better if a single large pressure regulating valve were installed on the main supply main at some convenient point to keep the pressures within usual limits. The installation of such a pressure regulating valve and of its accompanying pressure relief valve will be required, unless it can be shown to the satisfaction of this Commission that such an installation is impracticable.

As it is proposed to lay a large quantity of 4-inch pipe in this district the fire protection afforded in certain portions thereof will not be particularly good. But, as the buildings are mostly one or two story structures and as there is ample pressure, it is probable that the fire protection afforded will be sufficient for the needs of this district for some time in the future.

All pipes are to be laid in public streets or roads and it will not be necessary to acquire or to take any land for the purpose of constructing this system.

The mains of this company are the only possible source of supply for this district, unless the district itself install a pumping plant to take water from Lake Ontario. Such a plant would require a long intake in the lake and an efficient filter plant, thus necessitating heavy expense. It seems reasonably certain that the proposed project is the most advantageous for the people of this district.

The carrying out of the project of the petitioners will not have any adverse effect upon the water supply interests of any other community in the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. A pressure regulating valve of satisfactory type shall be installed on the main supply main in such a manner as to prevent the occurrence of pressures in the pipes greater than are customary in water supply systems. In addition, a suitable pressure relief valve shall be installed at a suitable point to insure the proper operation of the pressure regulating valve.

3. That after these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the water commissioners of the Sea Breeze water district as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 19th day of May, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 160

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application of the VILLAGE OF ALBION, Orleans county, N. Y., for the approval of its proposed source of water supply, maps, plans, project, etc.	*Decision*

Application filed April 28, 1914.
Hearing held at Albany May 12, 1914.
Decision June 11, 1914.
Approved.

William B. Dye, president of the board of trustees of the village of Albion, acting in the name and behalf of that village, on April 27, 1914, made application to the Conservation Commission for its approval of the project of the village of Albion for the purchase of a water supply system and the acquisition of certain additional sources of water supply.

After due notice published in the *Orleans Republican* and the *Orleans American*, both of Albion, a hearing was held on this application in the office of the Conservation Commission in the city of Albany at 10 A. M., May 12, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The village was represented by William B. Dye, village president, and Gerald B. Fluhrer, village attorney. No objections to the project of the applicant were filed and no one appeared in opposition.

It is proposed to purchase for the sum of $100,000 the entire waterworks system now operated by the Albion Water Works Company in and about the village of Albion. This purchase is to include the existing wells by the pumping station of that company, the storage reservoir and pumping station on Otter creek near Eagle Harbor, the standpipe of the company south of the village and all connecting mains, the pumping station and distribution system and all lands and property now owned and used by the Albion Water Works Company and the Kipp estate.

As an additional source of water supply the village proposes to use two wells which have been driven on the so-called Marshall farm, two miles south of the village. These wells have been sunk along the margin of a small marsh which forms the head waters of the west branch of Sandy creek. They are almost entirely in limestone rock. It is proposed to build near the wells a brick pumping station 40′ 0″ by 43′ 0″ inside dimensions and in this to install two triplex plunger pumps of 350 gallons per minute capacity each, each operated by a 14 horsepower oil engine.

These pumps are to take water from the wells and force it through two mechanical pressure filters 8 feet in diameter, 20 feet long and having a rated capacity of 350 gallons per minute each. Coagulant is to be introduced into the water before it enters the filters, but no coagulation basin has been provided. From the filters the water is to pass upward into an aerator, which consists of a coke filled steel tank, 16 feet in diameter, 3 feet deep, with perforated sides, elevated upon a steel support 30 feet above a steel receiving tank, 60 feet in diameter and 25 feet deep. Water is to be discharged into the upper tank by a cast-iron pipe rising vertically in its center, is to flow through the coke and through the perforated sides and then to fall into the lower tank. The flow line of this lower tank is to be at the same elevation as the flow line of the present standpipe. Tank and standpipe are to be connected by a 10-inch cast-iron pipe line.

Land is to be acquired around the wells at the Marshall farm for the pumping station and aeration plant near them and for a right of way for the pipe line from the pumping station to the nearest highway. The remainder of the new piping is to be laid in public streets and roads.

In addition it is proposed to build certain extensions to the distribution system now installed in the village. These additions and extensions are to be constructed to furnish water for domestic purposes and fire protection in certain outlying portions of the village now beyond the reach of the waterworks system. These extensions are to consist of 28,000 lineal feet of 6-inch piping and 60 additional fire hydrants.

Otter creek at Eagle Harbor is desired as a reserve source of water supply to be developed at a later date. Detailed plans for this development have not been submitted.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the reports of the Commission's engineers, it appears as follows:

Albion is the county seat of Orleans county. It is situated near the center of that county on the Niagara Falls division of the New York Central and Hudson River railroad and on the Erie canal. Albion was incorporated as a village in 1828 and has remained incorporated until the present time. By the last census enumeration the population was 5,016. At the time of the last roll the assessed valuation of taxable property within the village limits was $3,913,046. This village has a bonded debt of $150,000 for sewers and about $70,000 for a school house, a total of $220,000, and an additional bond issue of $32,000 has been authorized for street paving.

For the last twenty-seven years the people of the village of Albion have been supplied with water for domestic purposes and fire protection by the Albion Water Works Company. The original source of water supply for this company was from fourteen driven wells located near the Erie canal in the northwesterly corner of the village. From these wells water is pumped directly into the mains. In 1907 a small pumping station was installed at Eagle Harbor on the bank of Otter creek, about a mile and a half west from the original pumping station. A small dam was built across this creek and water pumped from the pond thus formed through a 6-inch pipe to a filter near the original pumping station. After passing through this filter this water is pumped into the mains.

The distribution system in the village streets consists of about 10 miles of 10-inch, 8-inch and 6-inch cast-iron pipe and over 3,000 feet of small galvanized iron pipe. Ninety-eight hydrants are provided for fire protection.

On the high ground south of the village is located a standpipe 25 feet in diameter and 75 feet high, which, when full, gives a pressure on the main street of the village of 65 pounds per square inch. The main pumping station is equipped with two compound duplex steam pumps of 750 gallons per minute capacity each, with the necessary boilers and auxiliaries and one motor-driven power pump of 500 gallons per minute capacity. At Eagle Harbor there is installed a motor-driven centrifugal pump of 250 gallons per minute capacity.

From time to time it has happened that the yield of water from the wells has been insufficient to supply the demands of the village and at the same time the water from Otter creek has been unavailable. In these cases and in some cases of sudden demand due to fires, water has been taken from the Erie canal and pumped into the mains. This water being highly contaminated, the village authorities have not permitted it to be used except in times of emergency, and when it was not used the supply from other sources has at times been so small that the storage in the standpipe has been seriously depleted, with resulting reduction of pressure in the mains. The testimony does not show that the sources of supply of water for this system have ever failed completely.

The present consumption of the village is estimated at over 400,000 gallons per day. Of this amount the wells have usually been depended upon to yield 200,000 gallons per day; the remaining 200,000 gallons per day has been obtained from Otter creek or elsewhere.

The distributing system of the Albion Water Works Company was originally exceptionally well designed and well constructed and, although now almost thirty years old, it is in good condition and it appears that the village can well afford to pay $100,000 to obtain possession and control of this system. It is also evident that additional sources of water supply are needed by this village. A complete sewerage system has recently been completed and the demand for water has undoubtedly been largely increased by the installation of sewers and will doubtless increase rapidly in the near future.

At an election held January 20, 1910, a proposition to expend $2,500 in searching for a source of water supply for this village was authorized by the carrying in the affirmative of a proposition to that effect. On January 30, 1912, the village authorities made application to the Conservation Commission for its approval of the construction of a complete municipally owned water supply system in this village, water for which was to be obtained from the wells on the Marshall farm above mentioned. This petition was filed in the office of the Conservation Commission February 1, 1912, but, as the project had not at that time been authorized by vote of the people, action upon it was deferred. Thereafter the village board submitted to the taxpayers, at an election to be held May 31, 1912, a proposition for bonding the village for $130,000 for the purpose of constructing this proposed water supply system. This election was held and the proposition carried in the affirmative by a large majority. On December 3, 1912, after extended hearings and investigation the Conservation Commission approved of this application. On September 9, 1912, the Albion Water Works Company made application to the Conservation Commission for approval of its plans for the development of an additional source of water supply on Otter creek at Eagle Harbor. This application was filed September 11, 1912, due hearing was had thereon and it was approved April 21, 1913. On March 28, 1913, the Albion Water Works Company made application to the Supreme Court of the State of New York for a writ of certiorari, in order that the decision of December 3, 1912, made by the Conservation Commission on the application of the village of Albion, might be reviewed and corrected upon its merits. This writ was issued by Hon. Cuthbert W. Pound, justice of the Supreme Court, at Niagara Special Term on March 29, 1913. No argument was had upon this writ.

On February 2, 1914, the Albion Water Works Company and the executors of the estate of George W. Kipp gave to the village of Albion an option for the purchase of all property, real and personal, of said company and estate in and about the village of Albion used or intended to be used in the conduct of the waterworks business of the company, excepting only certain accounts payable to the company and certain damages and claims for damage against the State of New York for the taking of certain lands from the company for canal purposes. This option gave the village the right to purchase these works for the sum of $100,000.

At a meeting of the board of trustees of the village of Albion on February 28, 1914, a proposition to issue village bonds for $100,000 for the purpose of purchasing the existing system and for $65,000 for the construction of extensions and the making of improvements thereto was submitted to the electors of the village at the election to be held March 20, 1914. This election was duly held and the proposition carried in the affirmative by a large majority. The village president was authorized to make the present petition to the Conservation Commission by resolution of the board of trustees of the village, duly adopted at a meeting held April 20, 1914.

Plans for the proposed extensions and construction at the Marshall farm, estimates of cost and specifications for these extensions and new construction were prepared by the J. F. Witmer Company, Engineers, of Buffalo. These plans and specifications were submitted with the application to the Conservation Commission.

In approving the previous application of the village of Albion this Commission has already permitted these wells to be used as a source of supply for the village. However it is deemed wise to repeat here the language used in the original memorandum of December 3, 1912:

> "While these measurements indicate that an adequate amount of water is now available, the petitioner should not lose sight of the fact that there is always present an element of uncertainty as to the permanency of the rate of yield from underground sources."

In approving the application of the Albion Water Works Company, this Commission determined Otter creek to be a suitable source of water supply for this village, provided that a satisfactory filtration plant be installed for the purification of the water therefrom. If this source is to be used it will be required that all water drawn from it be purified to the satisfaction of this Commission and that the watershed be protected by sanitary rules enacted by the State Department of Health.

Estimates submitted with the application indicate that the proposed extensions to the distribution system can be constructed for the sum of $22,000 and that the proposed works at the Marshall farm will cost about $39,000. These estimates are believed to be reasonable.

By developing Otter creek instead of the Marshall farm wells the village can get more and better water for less money. Evidently it would be to the great advantage of the village to abandon any idea of developing these wells. At the earliest possible date a proposition should be submitted to the people of Albion to authorize this abandonment and the use of the money appropriated for the development of these wells in developing an additional supply of water from Otter creek.

The proposed extensions and works at the Marshall farm, if constructed in accordance with plans and specifications submitted, of suitable materials and with good workmanship, will be safe. The safety of the existing system has been proved by nearly thirty years of continuous operation. Plans have not been submitted for any additional works at Eagle Harbor and it will be required that before this creek shall be used as a permanent source of supply for the village, suitable plans and specifications for the works proposed to be constructed be submitted to this Commission for its approval and thereafter such works be completely constructed in accordance with plans and specifications which have been so approved.

The use of water from Otter creek as a permanent source of supply will not be permitted until a suitable filter for this water has been installed, but, pending the completion of additional water supply works for this village, the use of this water after passage through the existing filter will be permitted, provided that satisfactory apparatus for the sterilization thereof is installed and operated to the satisfaction of this Commission.

Alternative sources of supply for this village have been carefully and exhaustively studied. There appear to be but two sources which could be developed by the village acting alone. These are Lake Ontario, which is so distant from the village that water could be obtained from it only at great expense, and the Erie canal, which is not a suitable source of water supply and the use of which for such purpose this Commission will not authorize.

It does not appear that the purchase of this waterworks system by the village of Albion, or acquisition and use by the village of the wells on the Marshall farm and of Otter creek as sources of water supply, will adversely affect the water supply interests of any other community in the State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and provide for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. If any source of supply is to be developed other than the wells near the canal now used by the Albion Water Works Company, a complete system of pumping and purification works must be installed for this purpose in accordance with plans and specifications which have been approved by this Commission.

2. No water shall be pumped from the wells on the Marshall farm to the distribution system or to the standpipe until such water shall have been purified in a manner satisfactory to this Commission.

3. While works for the utilization of water from the Marshall farm wells are being constructed, water from Otter creek may temporarily be pumped to the village mains, but only after filtration through the present filters and sterilization of the effluent therefrom by approved apparatus and to the satisfaction of this Commission.

4. After the completion of the works on the Marshall farm, Otter creek shall not be used further as a source of water supply until a purification plant satisfactory to this Commission has been constructed and thereafter all water pumped from Otter creek to the distribution mains of the village, or supplied to any person for domestic and household purposes, shall be filtered in a manner satisfactory to the Commission.

5. As soon as it is determined to use Otter creek as a permanent source of supply, application shall at once be made to the State Department of Health for the enactment of suitable rules for the sanitary protection of the watershed of this stream. Thereafter these rules shall be rigorously enforced.

6. Nothing in this approval shall authorize the village of Albion to take water from any part of the canal system of this State.

7. After any of these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the village of Albion as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 11th day of June, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 161

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the VILLAGE OF EAST SYRACUSE for approval of plans for an additional water supply.
} *Decision*

Application filed May 7, 1914.
Hearing held at Albany May 18, 1914.
Decision June 4, 1914.
Approved.

Fred M. Shepp and Jay Patterson, a majority of the board of water commissioners of the village of East Syracuse, on April 27, 1914, made application to the Conservation Commission for its approval of the project of the village for the acquisition of an additional source of water supply and of the plans for the proposed waterworks construction for the utilization thereof. This petition was filed in the office of the Conservation Commission May 16, 1914, and was subsequently withdrawn and replaced by another petition verified on the 30th day of April, 1914, and filed May 16, 1914. On May 19, 1914, the Commission caused the site of the proposed works, the proposed and present sources of supply to be inspected by one of its engineers.

After due notice published in the *Weekly Bulletin* of East Syracuse, the East Syracuse *News* and the Syracuse *Herald*, a hearing was held on this petition in the office of the Conservation Commission in the city of Albany at 2 P. M. May 18, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners were represented by Arthur C. Mead, Esq., village attorney, and by Fred M. Shepp, chairman of the board of water commissioners, in person. No objections were filed and no one appeared in opposition.

It is proposed to take or acquire as an additional source of water supply for East Syracuse certain springs on the easterly slopes of the valley of Butternut creek, 9½ miles south of the village. Small concrete collecting basins, 3 feet by 3 feet in plan and 4 feet deep, are to be constructed at the several springs. Water from these is to be led by cast-iron pipes to a covered concrete collecting basin, 10 feet by 10 feet in plan and 5 feet deep, and from thence is to flow by gravity through an 8-inch cast-iron pipe line to another collecting basin which is to be built near a similar collecting basin which forms part of the present system. This new basin is to be connected to the old supply main. This proposed additional system is to operate entirely by gravity. No filters or other purification works are to be installed.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

East Syracuse is a village in Onondaga county, which was incorporated on November 16, 1881, under the provisions of chapter 291 of the Laws of 1870. This village has a separate board of water commissioners, which has supervision of all water supply matters. In 1910 this village had a population of 3,274, but this population has been rapidly increasing and is now estimated at 3,800. According to the last roll the assessed valuation of taxable property therein was $1,382,005. The village has outstanding bonds of $75,000 for its waterworks system and $70,000 for its sewerage system, a total of $145,000.

East Syracuse is situated about two miles east of the easterly limit of the city of Syracuse, on the main line of the New York Central and Hudson River railroad, on the West Shore railroad and on the Erie canal.

In 1892 a municipal system of waterworks was constructed in East Syracuse at a cost of $75,000. Various improvements and small additions have since been made to the system.

The present source of supply is Wright brook, the northerly branch of a stream which flows in an easterly direction into Butternut creek above the village of Jamesville and below the reservoir on the canal feeder near that village. On this stream about one mile east of Butternut creek has been constructed a small intake basin. Various springs lying to the south in the flats of Russ brook, the southerly branch of this stream, have been piped to this basin or the stream above it. These springs are covered with concrete houses and discharge through wooden pipes. Russ brook, formerly a source of supply for the village, has been diverted around the intake basin by a ditch. Water flows from the intake basin through a line of cast-iron pipe to a covered concrete collecting basin and thence northerly through a cast-iron pipe line to a distribution reservoir situated a mile south of the village. This reservoir has a capacity of 2,800,000 gallons and is situated at such an elevation as to give satisfactory fire pressure on the village mains. In quality the present supply is not entirely above suspicion in spite of the recent improvements made by advice of the State Department of Health.

For some three years past the yield from this source of supply has not been sufficient for the needs of the village during the dry season. Connections have been metered and the use of water restricted, but at times it has been necessary to supplement the present supply by water purchased from the Syracuse Suburban Water Company. As the village has a sewerage system it is particularly important that an ample supply of water be maintained to avoid unsanitary conditions. Population is rapidly increasing and will probably continue to do so. It is evident that steps must be taken at once to increase the amount of water available for this village during the summer months.

For some years past the authorities of this village have been saving money for the purpose of extending their water supply system and at present this fund amounts to $10,000. On February 27, 1914, the board of water commissioners recommended the adoption of the plans now under consideration and asked the board of trustees to submit to the electors of the village a proposition authorizing a bond issue of $15,000 for the construction of these additional works. On the same day the board of trustees authorized the submission of this proposition to the electors and at the annual election on March 17, 1914, the proposition was carried in the affirmative by a large majority. On April 27, 1914, the board of water commissioners, by resolution duly adopted, authorized the making of this petition to the Conservation Commission.

Plans for the proposed works and reports and estimates thereon were prepared by Mr. George E. Higgins, a civil engineer having an office in the city of Syracuse, and these plans, reports and estimates were submitted with the application to this Commission.

The proposed source of supply consists of a number of springs issuing from the easterly slope of the valley of Butternut creek. These springs appear at approximately the same elevation and apparently are caused by the overflow of water from a nearly horizontal pervious stratum in the limestone formation of this locality. Gagings of the principal spring were made on three different occasions during the past winter and summer and showed a substantially unvarying yield of about 135,000 gallons per day. The brook fed by all of these springs had a discharge of about 350,000 gallons per day. While it is impossible to determine the limits of the watershed feeding these springs, and it is therefore impossible to make an accurate prediction as to the yield from such a source, there seems no reason to doubt but that there will be available sufficient water materially to augment the present supply of the village.

Chemical and bacteriological analyses of the water from the principal spring and from the effluent stream were submitted. Those from the stream showed traces of contamination, doubtless due to the pasturing of cattle around these springs. The analyses from the stream itself indicated that the water is very hard, but that it is of satisfactory sanitary quality. There are no buildings within the immediate vicinity of these springs and there is no apparent local source of pollution which should be regarded with anxiety. All springs are to be covered, the surrounding land fenced and the entrance of cattle into the enclosure prevented. Therefore it is believed that this water is of quality suitable for domestic use, including drinking, without purification.

Mr. Higgins has estimated that the proposed works can be constructed for $20,406.51. Lands and rights of way will cost from $3,000 to $4,000 in addition. The estimate appears to be reasonable and in all probability the works can be constructed without exceeding the amount of money available for the purpose. It is not proposed to build these works by contract, but they are to be constructed under the direction of the superintendent of waterworks and the village engineer.

The works, if properly constructed in accordance with the plans submitted, of proper materials and with careful workmanship, will be safe.

It is proposed to acquire seven acres of land immediately about the spring, twenty-six acres of land below them and one acre of land containing a house and an old grist mill. It is desired to purchase the mill property as the cheapest method of acquiring the water rights at that point. The large parcel of land contains few springs and is to be crossed by the pipe line, as it is of little value for farming purposes and it was found that the whole plot would cost little more than a right of way through it. Except for a few short cuts from which rights of way must be acquired, the pipe line is to be laid in public roads.

Alternative sources of supply exist. The yield from the present stream could be developed by the construction of storage reservoirs, or water could be obtained from Butternut creek. Water from either of these alternative sources might be contaminated and from the latter would undoubtedly require filtration. In spite of the extreme hardness of the water, it is probable that the proposed source of supply is at least as favorable as any other.

It does not appear that the installation of these works will affect the water supply interests of any other community of the State, with the possible exception of the village of Jamesville. This is a comparatively small hamlet now without a waterworks system. If water is in the future desired for this village, neighboring sources of supply can be utilized.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified, and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.
2. Brief specifications for the cast-iron pipe, covering manufacture, weights and placing of the same, shall be submitted to this Commission for its approval and the pipe lines shall be constructed in accordance with such approved specifications.
3. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the board of water commissioners of the village of East Syracuse.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and [L. S.] has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 4th day of June, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 162

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application of the VILLAGE OF NEW PALTZ, Ulster county, N. Y., for the approval of its proposed source of water supply, maps, plans, projects, etc.	*Decision*

Application filed May 20, 1914.
Hearing held at Albany May 27, 1914.
Decision June 5, 1914.
Approved.

Harvey G. Gregory, president of the board of trustees of the village of New Paltz, acting for and in the name of said village, on May 18, 1914, made application to the Conservation Commission for approval of the project of the village for the purchase of the existing water supply system of the New Paltz Water Works Company and for certain extensions and additions thereto. This application was filed in the office of the Conservation Commission May 20, 1914.

Due notice of a hearing to be held before this Commission on May 26, 1914, was published in the New Paltz *Independent* and New Paltz *Times*, but, by consent of parties interested, this date was changed and the hearing was held in the office of the Conservation Commission in the city of Albany at 2 P. M., May 27, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioner was represented by J. H. Vanderlyn, Esq., village attorney, and George J. Young, Esq., appeared in opposition, representing Daniel Smiley, who had filed objections.

It is proposed by the village of New Paltz to purchase all the property of the New Paltz Water Works Company now used to supply the inhabitants of that village with water, including a farm of 127 acres on which the reservoirs of that company are constructed and rights of way for its pipe lines. This property is to be purchased for $42,000. An additional amount of $7,500 is to be expended in cleaning up the existing basins and in installing meters on the connections in the village. The village also desires the right at a future date to construct additional storage reservoirs upon this land now owned by the water company.

Daniel Smiley, one of the owners of a large tract of property about Lake Mohonk, filed objections to the granting of this application. These objections were filed as required by law in order that Mr. Smiley might be represented at the hearing and protect and conserve his rights to use water from springs and streams owned by him for the supply of certain cottages and hotels on his property, which streams and springs are tributary to the stream now supplying water to the company.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the reports of the Commission's engineers, it appears as follows:

New Paltz is a village in Ulster county, duly incorporated under the laws of the State of New York on December 15, 1887. This village is situated in the valley of the Wallkill, about eight miles west of Poughkeepsie. It is estimated that 1,230 persons are resident therein and in addition there are some 300 students at the State Normal School. The last roll showed the assessed valuation of property within this village to be $331,125. The village has no outstanding indebtedness.

New Paltz Water Works Company has been supplying water to the inhabitants of the village of New Paltz for twenty-two years. Recently the amount of water supplied by this company has been insufficient to meet the demands of the village. It is believed that the draft on this company's sources of supply has been abnormally large on account of leakage and carelessness of the inhabitants. On account of financial difficulties the company has been unable to repair its works so as to prevent leakage and to install meters on the house connections in order to curtail waste and excessive use of water.

Within the last few years there has arisen in the village strong demand that the municipality shall take over and operate the waterworks system. On February 24, 1914, the board of trustees of this village submitted to the annual election, to be held March 17, 1914, two propositions: (1) To purchase the present system for $42,000 and (2) to issue village bonds in the amount of $49,500, $42,000 for the existing works and $7,500 to be expended for betterments and extensions. This election was duly held and the propositions carried by large majorities.

Plans and estimates showing the present system and source of supply and various alternative sources were prepared and submitted to the village by H. Lester Newhall, C. E. Copies of these plans, reports and estimates were filed with this petition.

The existing reservoir of the company will yield sufficient water to meet the reasonable necessities of this village, but the present waste and extravagance in the use of water must be curtailed.

Analyses of water from the present sources were submitted and indicate that this water is of excellent quality for all purposes. The watershed tributary to the two reservoirs used for domestic supply is uninhabited, rugged, mountainous country, closely timbered, and no source of pollution exists, except certain driveways within the more remote portions of the watershed. In view of this absence of pollution and the fair amount of storage provided in the reservoirs, it is believed that this water will be of quality suitable for drinking without purification. It will be required, however, that the future construction of buildings upon this watershed be rigidly restricted and it will therefore be required that the village at once make application to the State Department of Health for the enactment of suitable rules for the sanitary protection of this watershed and that thereafter these rules be rigorously enforced.

The safety of the works proposed to be purchased has been proved by years of use. This system would, however, be improved by the enlargement of the diameter of the supply main where it crosses the Wallkill and the substitution of a larger diameter pipe for the 4-inch mains now forming part of the distribution system. Four-inch pipe lines seldom give adequate fire protection.

If in the future the village desires to construct additional storage reservoirs on the lands now owned by the water company, detailed plans and specifications for the necessary dams must be submitted to this Commission for its approval and thereafter such works must be fully constructed in accordance with plans and specifications which have been so approved.

Alternative sources of supply exist, but these offer no advantages over that now proposed to be acquired.

The carrying out of the proposed project of the applicant will in no way affect the water supply interests of any community in the State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. Application shall at once be made to the State Department of Health for the enactment of suitable rules for the sanitary protection of this watershed. Thereafter such rules shall be rigorously enforced by the village authorities.

2. No new storage reservoirs shall be constructed on lands now owned by the New Paltz Water Works Company until detailed plans and specifications for the proposed dams shall have been submitted to this Commission for approval and thereafter any such reservoir shall be completely constructed in accordance with plans and specifications which have been so approved.

3. After such reservoir has been constructed it shall be inspected by and be subject to the approval of this Commission and such reservoir shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

4. Nothing in this decision and approval shall be held to vest in the village of New Paltz any rights to the flow of water in the streams forming the present sources of supply of the New Paltz Water Works Company, at points above the lands now owned by that company, in addition to the rights now owned and enjoyed by said New Paltz Water Works Company.

Wherefore, the Conservation Commission does hereby approve the said application of the village of New Paltz as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 5th day of June, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 163

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the water commissioners of the MONROE WATER DISTRICT of the town of Brighton for the approval of plans.
Decision

Application filed May 20, 1914.
Hearing held at Rochester June 3, 1914.
Decision June 11, 1914.
Approved.

Arthur Warren, Jerome Todd and Frank Rowland, the water commissioners of the Monroe Avenue water district of the town of Brighton, Monroe county, on May 15, 1914, made application to the Conservation Commission for its approval of the plans of the petitioners for the construction of a water supply system in said district and of the purchase of water therefor from the Rochester and Lake Ontario Water Company. This petition was filed in the office of the Conservation Commission May 20, 1914.

After due notice published in the *Rochester Herald* and the *Union and Advertiser* of Rochester a hearing was had on this application in the Monroe county court house in the city of Rochester at 10:30 A. M. on the 3d day of June, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners were represented by William MacFarlane, Esq., their attorney. No objections were filed and no one appeared in opposition.

It is proposed to build in the various streets of this district a distribution piping system, composed of 11,550 feet of 8-inch, 1,913 feet of 6-inch and 12,599 feet of 4-inch diameter cast-iron pipes. Seven fire hydrants are to be installed for the purpose of flushing the dead ends of this system. Water is to be purchased from the mains of the Rochester and Lake Ontario Water Company.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the reports of the engineers of the Commission, it appears as follows:

Monroe Avenue water district is a portion of the town of Brighton, Monroe county, comprising 595 acres of land with irregular boundaries. This district extends along Monroe avenue from the southerly limits of the city of Rochester near Cobb Hill to the boundary line between the towns of Brighton and Pittsford. It is traversed by the old Erie canal, the Auburn branch of the New York Central and Hudson River railroad and the electric railroad between Rochester and Pittsford. At present this district is not built up, but it is well adapted to suburban real estate development and is so located that a material increase in the population thereof can be expected in the future.

On April 25, 1914, a petition for the formation of this district was filed with the town clerk of the town of Brighton. Thereafter on May 9, 1914, at a meeting of the town board of said town, duly called, it was determined that said petition was in fact signed by a majority of the owners of taxable real property within the proposed district and duly acknowledged in the manner of a deed to be recorded, and thereupon the town board duly filed an order forming said district and appointed the petitioners herein water commissioners therefor. Thereafter these commissioners duly qualified for office and filed the necessary bonds.

The petition shows that the present population of this district is about 420, but that a future population of over 8,000 is expected and allowed for in the design of the works. The assessed valuation of taxable property within this district was $285,400 by the last roll. The amount authorized to be expended upon this water works system was $25,000.

Monroe Avenue water district is now entirely without any public water supply system. Water for the domestic purposes of the present inhabitants is obtained from ordinary wells, some of which are of doubtful quality and all of which have but a limited yield. There is no water available for purposes of fire protection.

Plans for these proposed water works were prepared by Mr. R. Edward Gaskin, a civil engineer, having a place of business in Rochester. Reports, specifications and estimates of cost for this system were prepared by Mr. Gaskin and were submitted with this application.

It is proposed to purchase water for this district from the mains of the Rochester and Lake Ontario Water Company. This company pumps water from Lake Ontario at a point west of the mouth of the Genesee river and filters it by a battery of mechanical pressure filters. From the lake, the company's force main runs in a southerly direction to the main line of the New York Central and Hudson River railroad at Lincoln Park and thence easterly along the right of way of this railroad through the city of Rochester to a standpipe situated on Cobb Hill. This standpipe is within less than a mile of the boundaries of Monroe Avenue water district and water will be supplied from it directly to the district by gravity. The elevation of the standpipe is such as to give static pressures in the mains of the district of from 44 to 90 pounds per square inch, the average pressure being about 78 pounds per square inch. These pressures and the sizes of mains are sufficient to give ample water for domestic uses and fair fire protection when this is desired. On account of the large proportion of 4-inch diameter pipe in the system the fire protection in some sections will never be really good.

In acting upon several previous applications this Commission has determined that the quality of the water supplied by the Rochester and Lake Ontario Water Company is suitable for domestic use, including drinking. The source of supply used by this company is inexhaustible and the capacity of its plant can readily be increased. Therefore it appears that the company can supply sufficient water for the needs of the inhabitants of this district without detriment to the interests of its present customers.

The engineer has estimated that the present works can be constructed for $25,000. This estimate appears to be reasonable.

The works, if properly constructed in accordance with plans and specifications submitted, of suitable materials and with careful workmanship, will be safe.

No land is to be taken or acquired for the purpose of the construction of this waterworks system, as all the pipes are to be laid in public streets and roads.

Although alternative sources of supply doubtless exist, none of these offer advantages comparable with those of the proposed source.

The carrying out of this project will not in any way adversely affect the water supply interests of any other community in the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the water commissioners of the Monroe Avenue water district as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 11th day of June, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE.
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 164

CITY OF WATERVLIET.

Application filed May 25, 1914.

Hearings held in Albany, June 16, July 7, 8 and 9, 1914.

Watervliet water board asks for approval of plan for obtaining a supply of water for the city from Normans Kill at French's Mills and for construction of an entirely new distribution system in said city, water to be pumped by water power and delivered without purification. Estimated cost, $497,000.

The project opposed by Watervliet Hydraulic Company, which corporation owns the existing waterworks system in said city and by several others.

Extended hearings have been held and investigations are still in progress.

WATER SUPPLY APPLICATION NO. 165

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the BOARD OF WATER COMMISSIONERS OF THE RIVERHEAD WATER DISTRICT of the town of Riverhead, county of Suffolk, State of New York, for the approval of its plans and the permission to obtain the right, either by purchase or condemnation, to adopt, appropriate and use certain underground waters situated in said district, in the town of Riverhead, county of Suffolk, State of New York, and certain lands connected therewith.

Decision

Application filed June 2, 1914.
Hearing held in New York, July 14, 1914.
Decision September 8, 1914.
Approved.

William F. Flanagan, H. Harrison Corwin and O. Edmund Griswold on May 22, 1914, made application to the Conservation Commission for its approval of the project of the applicants to acquire a source of water supply and to construct a water supply system in and for the Riverhead water district of the town of Riverhead, Suffolk county. This petition was filed in the office of the Conservation Commission June 2, 1914. On August 7, 1914, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

Notice of a hearing on this application, to be held in Odd Fellows Hall in the village of Riverhead on June 18, 1914, was duly published in the *County Review* of Riverhead, the Riverhead *News*, the *Republican Watchman* of Greenport and the *Argus* of Patchogue, but at the request of the applicants this hearing was postponed and it was finally held at the office of the Conservation Commission in the city of New York at 10 A. M., July 14, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioners appeared by Nathan D. and Nathan O. Petty, their attorneys, represented by Nathan O. Petty, Esq. Objections were filed by the Riverhead Water Company and by Timothy M. Griffing. At the hearing the objectors appeared by Robert P. Griffing, Esq., their attorney.

It is proposed to obtain a supply of water for Riverhead water district from five driven wells to be sunk to depths or from 100 to 150 feet near the westerly limits of the district and just north of the Long Island railroad tracks. Water from these wells is to be pumped to an aerator, to flow thence by gravity into a concrete collecting basin of 65,000 gallons capacity and to be pumped from said basin through two mechanical pressure filters, 8 feet in diameter by 20 feet long, to a 150,000 gallon capacity elevated steel tank. This pumping is to be done by one low lift and two high lift triplex-plunger power pumps of 500 gallons per minute capacity each. These pumps are to be driven by producer gas engines. Suitable gas producers and auxiliaries are to be provided and all of this apparatus is to be housed in a brick pumping station situated near the wells. The elevated tank is to be on a knoll adjacent to the pumping station, with its base 125 feet above the level of the ground and at an elevation such as to give a pressure of 65 pounds per square inch on the distribution system. In the various streets in the district are to be laid from eight to nine miles of cast-iron pipe from six inches to fourteen inches in diameter, to which are to be connected 105 fire hydrants. These hydrants are to have double hose nozzles and the majority of them also are to have a steamer connection.

The objectors pointed out that the Riverhead Water Company had for many years supplied a portion of this district with water and claimed that in view of this fact some provision should be made for the purchase of the system of that company. They conceded that their own system is inadequate and that greater fire protection and a greater quantity of a better quality of water is necessary.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the Commission's engineer, it appears as follows:

The petitioners are the duly appointed, qualified and acting water commissioners of Riverhead water district of the town of Riverhead, Suffolk county. Said district was formed by order of the town board of said town of Riverhead on April 14, 1914, and the petitioners were duly appointed by said board at a meeting held April 16, 1914. This district was formed pursuant to a petition therefor, signed by a majority of the owners of taxable real property within said district and duly acknowledged by them, which petition was filed in the office of the clerk of said town on March 25, 1914.

Riverhead is the county seat of Suffolk county and is situated on the left bank of Peconic river near the point of junction of that stream with Flanders bay; it is traversed by the Greenport branch of the Long Island railroad. The village is unincorporated. According to the petition this district has a population of about 3,500 and the assessed valuation of taxable property therein at the time of the last roll was $1,383,725.

Since 1892 the Riverhead Water Company has supplied water for domestic use and fire protection to certain portions of this district. This company is a domestic corporation with a capital stock of $13,000 and no outstanding bonds. Its source of supply consists of ten wells driven in the neighborhood of Peconic river. From these wells water is pumped to a wooden tank in the so-called Tower Mill and from thence it flows by gravity to the distribution piping. The pumping plant consists of a horizontal one-cylinder double acting power pump of 100 gallons per minute capacity, a triplex-plunger power pump of 125 gallons per minute capacity, a triplex-plunger power pump of 500 gallons per minute capacity, the water wheels installed in the Tower Mill and a 30 horse-power gasoline engine. The first pump named is now out of use, the other two can be run by water power, but the normal method of operation is to run the smaller pump by water power and, in case of emergency, to run the larger pump with the gasoline engine. The tank is of wood, 26 feet in diameter and 16 feet high, holding 63,000 gallons. It is 75 feet higher than the ground level at the mill. The distribution system consists of something over 2.5 miles of cast-iron pipe, 8 inches, 6 inches and 4 inches in diameter, to which 27 fire hydrants of five different makes are attached. It is stated that the actual cost of this system was $26,168.

As far as known the yield from these wells has been sufficient to meet the demands of the customers of the company. The water drawn from them has been free from disease germs, but has at times been highly colored and so charged with iron as to make it disagreeable for drinking and unsuitable for laundry purposes.

It is evident, and the water company concedes, that its existing system is not sufficiently extensive, the capacity of its pumping plant is too small, the pressures on its mains are insufficient and the water supplied by it is not of suitable quality to meet the needs of the district. The company states that it is financially unable to put in the extensions, additions and betterments which are manifestly required.

Plans and specifications for and reports and estimates on the proposed water supply system were prepared by Walter E. Sexton, a civil engineer, having an office in the village of Mineola. These plans and papers were submitted to the town board with the petition for the formation of the district and were also filed with this Commission.

None of the proposed wells has yet been sunk and therefore tests of capacity have not been made, nor has the water been analyzed. The ground water conditions of Long Island are well known and there is little question but that sufficient water for the needs of this district can be obtained from driven wells at or near the proposed pumping station. As a rule the quality of Long Island waters is good, but it is expected that the water from the proposed wells, although it will probably be almost free from living organic matter, will be highly charged with iron. It is to remove this iron that the aerator, sedimentation basin and filters have been provided by the plans. If additional purification should be necessary coagulant can readily be introduced into the water as it enters the collecting basin. By so doing the efficiency of the filters can be materially increased. It will be required that after one or more of these wells have been sunk analyses of water from them be made and submitted to this Commission. It will further be required that a coagulating device be installed if the results of these analyses or of future analyses of the water should show necessity for more efficient treatment.

The order of the town board authorized the expenditure of $100,000 for the construction of this project. It seems probable that the works can be completely constructed for the amount of money available.

The works, if properly constructed in accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, will be safe and will supply the inhabitants of this district with an adequate amount of water of satisfactory quality and in quantities and under pressures sufficient to afford reasonable fire protection.

A parcel of land is to be acquired north of the railroad and near the westerly limit of this district. This plot will be of sufficient size to contain the pumping station, tank, sedimentation basin and the five wells. More land is available in the neighborhood if required for additional wells.

The carrying out of the project of the petitioners will in no wise affect the water supply interests of any other community in this State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. After one or more of the proposed wells have been sunk and water has been pumped therefrom for a suitable interval of time, complete physical, chemical and bacteriological analyses shall be made of samples of water from these wells and the results submitted to the Conservation Commission. If the results of these analyses are unsatisfactory the proposed source of supply shall be abandoned or additional purification works shall be installed to the satisfaction of this Commission.

3. After the completion of this water works system all water supplied to the distribution piping shall be purified to the satisfaction of this Commission.

4. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the water commissioners of Riverhead water district in the town of Riverhead, Suffolk county.

IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the [L. S.] same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 8th day of September, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 166

CITY OF NEW YORK — SCHOHARIE SOURCES.

Application filed June 2, 1914.

Hearings held at Catskill, September 15, 1914, and at Albany, September 30, 1914.

The city wishes to use that portion of the drainage area of Schoharie creek lying above the village of Prattsville as an additional source of water supply. It is proposed to utilize this water in connection with Ashokan reservoir and Catskill aqueduct now nearing completion. Estimated cost, $14,216,000.

The project opposed by many persons, corporations and municipalities.

Hearings have been completed and decision will be made in the near future.

WATER SUPPLY APPLICATION NO. 167

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application for approval of plans, etc., for water supply for VILLAGE OF LYONS, N. Y.	*Decision*

Application filed June 8, 1914.

Hearing held at Lyons, June 23, 1914.

Decision August 20, 1914.

Approved.

Clyde W. Knapp, president of the municipal board of the village of Lyons, acting for and in the name of said village and board, on June 4, 1914, made application to the Conservation Commission for its approval of the project of said village for purchasing the system of the Lyons Water Works Company and for obtaining a new and additional supply of water for the village. This application was filed in the office of the Conservation Commission June 8, 1914. On June 19, 1914, the Commission caused the site of the proposed works and the proposed source of water supply to be inspected by one of its engineers.

After due notice published in the *Lyons Republican* and the *Wayne Democratic Press*, both of Lyons, a hearing was held on this petition in the Wayne county court house in the village of Lyons at 10:30 A. M. on June 23, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioner was represented by Charles P. Williams, Esq., village attorney. No objections were filed and no one appeared in opposition.

The village authorities propose to purchase all of the existing plant of the Lyons Water Works Company for the sum of $25,000. After acquiring the existing distribution system, it is proposed to build certain extensions thereto and to take up and replace certain of the mains in order that the entire area of the village may be supplied with water under pressures suitable for fire protection. A new standpipe, 25 feet in diameter by 70 feet high, containing 256,000 gallons, is to be constructed near the present standpipe. This latter structure is to be retained, but, as its maximum flow line is somewhat less than that proposed for the new one, it will ordinarily be cut out of service.

Water for the new system is to be obtained from a collection of small ponds in the town of Junius, Seneca county, situated just east of the boundary line between Ontario and Seneca counties, about nine miles south of Lyons and about six miles north of Geneva. In the bed of the outlet stream just below the lowest of these ponds an intake basin 18′ 6″ by 5′ 6″ in plan by 5′ 6″ deep is to be constructed. This is to be built of concrete and filled with broken stone. From it water will flow through two sluice gates into an adjacent collecting basin. This structure is to have two compartments, each 7′ 0″ by 7′ 9″ in plan by 5′ 6″ deep and is to be constructed of concrete. From the collecting basin the water is to flow to the village through 12-inch cast-iron supply pipe line 8.7 miles in length.

On the flats east of the inhabited portion of the village and north of the old Erie canal is to be installed a pumping and filtration plant. This is to consist of a brick building 43′ 0″ by 43′ 9″ in plan, situated on ground 95 feet lower than the water surface of the lowest pond. The plans show the lower end of the supply conduit to be directly connected to two mechanical pressure filters of 350 gallons per minute capacity each. These filters are shown 8 feet in diameter by 20 feet long, of the ordinary "New York" type. Auxiliary apparatus for the supply of coagulants to the water and for the sterilization of the effluent from the filters is to be provided. The filtered water is to flow into a circular well 10 feet in diameter by 15 feet deep, which also serves as a pump suction chamber. The pumping plant is to consist of two triplex plunger pumps of 350 gallons per minute capacity each, each operated by a 35 horse-power electric motor. This pumping plant will force water through the distribution system to the new standpipe. A venturi meter is to be installed in the pumping station to measure the total draft from the ponds.

The work on the distribution system consists of laying 4.7 miles of new pipe, relaying 0.86 mile of old pipe and the installation of 92 valves and 72 additional hydrants. The total estimated cost of the new construction is $130,000.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the Commission's engineers, it appears as follows:

Lyons is a village in Wayne county, incorporated under the provisions of chapter 750 of the Laws of 1907. The water supply system of this village is under the jurisdiction of the municipal board thereof, the applicant in this proceeding. Lyons is located in the southerly part of Wayne county, on the main line of the New York Central & Hudson River railroad and of the old Erie and the new Barge canals. According to the petition this village has a population of about 4,500. By the last roll the assessed valuation of taxable property therein was $2,047,875. The village at present has no bonded debt, but the issuance of bonds in the amount of $91,000 for the purpose of constructing a sewerage system has recently been authorized.

Since 1887 the inhabitants of the village of Lyons have been supplied with water by the Lyons Water Works Company. The distribution system of this company at present consists of about 9 miles of cast-iron pipe of from 4 to 10 inches in diameter, 59 hydrants and a steel standpipe 20 feet in diameter by 50 feet high, situated at an elevation such as to give a pressure of 82 pounds per square inch upon the lower portions of the village. On the bank of Ganargua or Mud creek near the westerly limit of the village is a brick pumping station containing two steam pumps of 1,000,000 gallons per day capacity each, with the necessary boilers and auxiliaries for the operation thereof. Water for this system was at one time pumped from driven wells. These have long been abandoned and the entire supply at present comes from Mud creek. No purification or sterilization works have ever been installed. The flow of water in Mud creek is sufficient for the needs of this village, but these waters are highly polluted with sewage and without purification are entirely unfit for domestic use.

The system of the Lyons Water Works Company is said to be in fairly good condition considering its age. The greater part of the piping is capable of giving good service. Electrolysis, caused by current from the electric car line, has seriously damaged something less than a mile of pipe. The pumping station has about reached the limit of its usefulness. It is evident that imperative necessity exists either for remodeling the waterworks plant, so as to provide for a complete system of filtration of the waters of Mud run, or for a new and additional source of water supply.

The question of installing a municipal water supply plant in the village of Lyons has been under consideration for some years. After thorough discussion and considerable investigation a preferential election was held on December 9, 1913, at which the electors of the village were asked to express their preferences with regard to four projects: (1) The acquisition of the present plant for $45,000 and the construction of extensions and filters at a cost not exceeding $50,000 additional; (2) installation of an entirely new water supply system, taking water from Clyde river at a cost not exceeding $102,000; (3) the purchase of the entire plant of the water company for $45,000 and the taking of water from Junius ponds at a cost not exceeding $95,000; (4) the construction of an entirely new water supply system, taking water from Junius ponds at a cost of $142,000. At this election the fourth project received an overwhelming majority of votes.

At a meeting held December 12, 1913, the board of trustees of the village of Lyons called a special election to be held December 30, 1913, to vote on the proposition of bonding the village for the sum of $142,000 for the construction of a new water supply system. This election was duly held and the proposition carried in the affirmative by a large majority. Thereafter further negotiations were had with the water company and, at a special meeting of the stockholders thereof on January 12, 1914, authority was given for the sale of the entire plant of that company for the sum of $25,000. On February 6, 1914, the board of trustees of the village called another special election, at which the taxpayers voted upon a proposition to bond the village in the additional sum of $25,000 for the purpose of purchasing the existing plant. This election was duly held and carried in the affirmative by a large majority. The making of the present application to the Conservation Commission was authorized by a resolution of the municipal board, duly adopted at a meeting held January 3, 1914.

Plans and specifications for the proposed works and a report thereon were prepared by the J. F. Witmer Company, a firm of engineers having an office in the city of Buffalo.

The proposed source of supply for the village of Lyons is a collection of small ponds in the town of Junius, Seneca county, known as the "Newton ponds." These ponds lie at an elevation of about 490 feet above sea level; the watershed tributary to them is about 0.75 square miles and the area of water surface about 0.07 of a square mile.

Last June a weir was installed upon the outlet of these ponds and readings of this weir were continued daily until September 21st, when it was washed out. During the driest period, lasting about two months, the lowest recorded flow was not less than 530,000 gallons per twenty-four hours. This would indicate that sufficient water can be obtained from these ponds to supply the people of Lyons for some years to come. By the construction of a small dam the elevation of the water surface at these ponds can be raised and a very considerable additional quantity of water stored in them. By so doing the yield can be materially increased.

The watershed tributary to these ponds is partly woodland and the rest farming country of no great productivity. There is but one house upon the apparent watershed of the ponds.

Analyses of the water of the Newton ponds have been made by several persons and the results thereof were submitted with the application. These indicate that the water from Newton ponds is not, in its untreated state, satisfactory for domestic use; but by proper filtration it can readily be made suitable for drinking purposes.

The engineers have estimated that the works will cost about $130,000. The sum of $142,000 is available for the construction thereof and it is probable that the works can be constructed without exceeding the money available.

In general the works, if constructed in accordance with the plans and specifications submitted, of suitable materials and with careful workmanship, will be safe and the resulting system will be capable of supplying a quantity of water of satisfactory quality adequate for all reasonable needs of the people of Lyons for domestic use, manufacturing purposes and fire protection.

It is stated that the proposed water works pumping station is to be situated near to the sewage disposal plant, which has recently been authorized. By so doing it is hoped to economize in operating cost by having the same man attend to both plants. To construct the water works filtration plant with a subterranean clear water basin, as shown by the plans, in immediate proximity to the settling tanks of the sewage disposal works would be to expose the entire water supply of the village to grave danger of direct contamination from the concentrated sewage of the village itself. In no case will these two plants be permitted to be constructed under one roof or immediately adjacent to one another. It will be required that the location of the water works pumping station with reference to the sewage disposal works be submitted to this Commission for its approval and that the water works plant be constructed at a point approved by this Commission.

The plans originally submitted provided mechanical pressure filters for the purification of the water from Newton ponds. The village later modified these plans by inserting in the specifications an alternative bid for gravity mechanical filters. In view of the somewhat contaminated condition of the waters from these ponds and the greater ease, certainty and economy in the operation of gravity filters and the fact that little or no difference in cost exists between the two types, this Commission will require that gravity filters be used and that they be constructed in accordance with plans previously approved by it.

All lands now owned by the Lyons Water Works Company are to be acquired as a part of the system. In addition the village is to purchase lands and rights of way for the headworks, supply conduits, pumping station, standpipe and short lengths of pipe. The majority of the proposed extensions to the distribution system are to be laid in public roads.

Alternative sources of supply exist, the most available of which are Mud creek and Clyde river. Both these streams are highly polluted and it is possible that the difficulty of adequately purifying water from them and the resulting cost of filtration would be so great as to justify the greater expenditure of going to Newton ponds.

The execution of the proposed project of the village of Lyons will not in any way adversely affect the water supply interests of any other community in this State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans as hereby revised.

2. After the new system has been completely constructed and put in operation, the present pumping station drawing water from Mud creek shall be disconnected and thereafter all water furnished to the distribution system of the village of Lyons shall be filtered in a manner satisfactory to this Commission.

3. Plans showing the relative location of the proposed water works pumping station and sewage disposal works shall be submitted to this Commission for its approval and the former shall be constructed at a distance from the latter satisfactory to this Commission.

4. The water, before being pumped to the distribution system of the village, shall be filtered through mechanical gravity filters constructed in accordance with plans and specifications which have previously been submitted to and approved by this Commission.

5. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the municipal board of the incorporated village of Lyons as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany, this 20th day of August, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 168

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the VARYSBURG WATER COMPANY, INC., a water works corporation, for the approval of its plans for a water supply for the village of Varysburg and vicinity.
} *Decision*

Application filed June 27, 1914.
Hearing held at Varysburg, July 27, 1914.
Decision September 8, 1914.
Approved.

George N. Cowan, president, and C. S. Hunt, secretary, acting in the name and on behalf of Varysburg Water Company, Inc., on June 18, 1914, made application to this Commission for its approval of the project of that company for the acquisition of a source of water supply and the installation of a water supply system in the unincorporated village of Varysburg, town of Sheldon, county of Wyoming. This petition was filed in the office of the Conservation Commission, June 27, 1914. On July 3 and 27, 1914, the Commission caused the site of the proposed works and of the proposed source of water supply to be inspected by one of its engineers.

After due notice published in the *Sheldon Democrat* of Varysburg and the Attica *News*, a hearing was held on this application in Wolf's Hall in the village of Varysburg at 9:30 A. M., July 27, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for and against the project, as shown by the minutes. The petitioner was represented by the Hon. John Knight, its attorney. Objections were filed by Chesbro Brothers of Attica and the Attica Gas and Electric Company. The objectors were represented at the hearing by Charles B. Prescott, Esq., their attorney.

Varysburg Water Company proposes to use as its source of water supply a spring on the farm of William Libby, about one mile west of the village, and two springs on the farm of Philip Wolf, about 6,400 feet south and east of the village. The Libby spring is at an elevation 325 feet higher than the village. At this spring a covered concrete spring chamber is to be constructed and the whole surrounded by a tight fence. From the spring chamber water is to flow through 1,650 feet of 2-inch merchant iron pipe to a distribution reservoir. This structure is to be of concrete and covered with a wooden roof. It is to be 48′ 0″ by 17′ 9″ in plan by 6′ 0″ deep and will hold 45,000 gallons. From the distribution reservoir a 6-inch cast-iron pipe line is to be laid to the village and in the village streets there is to be installed a distribution system of 6-inch and 4-inch cast-iron pipe. The entire system is to consist of 4,500 feet of 6-inch and 2,955 feet of 4-inch pipe. Eighteen double nozzle fire hydrants are to be installed to give fire protection. The flow line of the reservoir is to be 160 feet higher than the ground surface of the village. In case the yield of the Libby spring proves insufficient for the needs of the village, it is proposed to connect the Wolf springs to the distribution system. These springs are at an elevation twenty feet higher than the Libby spring. Plans for the necessary construction of the latter supply have not been submitted.

Chesbro Brothers and the Attica Gas and Electric Company filed objections protesting against the diversion of water from any tributary of Little Tonawanda creek, which stream is used by them for power purposes. The objection made was largely formal and intended to protect the rights of the objectors at such time as the question of damage to them should be adjudicated.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the Commission's engineer, it appears as follows:

Varysburg Water Company, Inc., is a domestic corporation, organized under the provisions of the Transportation Corporations Law. Its certificate of incorporation was filed in the office of the Secretary of State, November 12, 1913. This company has an authorized capital stock of $12,000 and outstanding bonds of $9,000. On May 17, 1912, the incorporators of this company petitioned the town board of Sheldon for permission to organize said company and this petition was granted May 18, 1912. This permit of the town authorities allows the company to furnish water to a district two miles in diameter with its center at Wolf's Hall in the village of Varysburg. The resident voters of this district on September 11, 1913, voted to establish a fire district and such district was duly established and commissioners therefor appointed. Thereafter on September 29, 1913, a contract was signed by the authorities of the fire district and the officials of the company, whereby the company undertook to install eighteen fire hydrants and to supply water to the district for fire protection and public purposes in consideration of the payment of $18 per hydrant per annum.

Varysburg is an unincorporated village in the town of Sheldon, Wyoming county. It is situated on Little Tonawanda creek and on the Buffalo, Attica & Arcade railroad, about eight miles south of the village of Attica. According to the petition this village has a population of about 200 persons.

At the present time Varysburg is entirely without a public water supply system; water for domestic purposes is obtained from a few driven wells, the yield from which is not entirely sufficient. There is absolutely no fire protection and very serious loss from fire has been experienced in the past.

Plans for the proposed system were prepared by Mr. G. N. Cowan, the president of the company. Mr. Cowan estimates that the total cost of the system will be $11,050.

Gagings of the flow from the spring on Libby farm have been made from time to time and have shown a yield of from 12,000 to 244,800 gallons per day. It is somewhat doubtful whether the yield from this spring can always be depended upon to be sufficient for the needs of the customers of the company.

An examination of the surroundings of the spring and the results of analyses made of the waters therefrom indicate that the water from this spring is satisfactory for all purposes including drinking. In order, however, to obviate any possible contamination of this water by surface wash, it will be required that: the spring be covered with a tight house which is kept locked, the land immediately around the spring be enclosed by a tight fence which will prevent the entrance of cattle, a suitable outhouse be constructed near the sap boiling shed above the spring, this structure shall be placed at a point satisfactory to this Commission and the officials of the company to see to it that the surroundings of this spring are maintained in sanitary condition during the sap boiling period.

Wolf springs have a yield of about 14,000 gallons per day. No analyses of the water from them have been made and no plans for collecting works at these springs have been submitted. One of the Wolf springs is highly charged with hydrogen sulphide gas. The use of water from these springs will be permitted, provided that: results of analyses of the water therefrom are satisfactory to this Commission; the collecting works are constructed in accordance with plans which shall have been submitted to and approved by this Commission; satisfactory precautions be taken to protect the sanitary quality of the water in these springs; it be shown that the sulphur content of the combined yield of the two springs is not so great as to render the use of the water disagreeable, or satisfactory means have been provided for the removal of this gas by aeration or otherwise.

The proposed works, if fully constructed in accordance with plans and specifications which have been approved by this Commission, of suitable materials and with careful workmanship, will be safe.

Land is to be purchased about the various springs and for the construction of the reservoir. Easements are to be acquired for some of the pipe lines. The bulk of the piping system is to be laid in public streets and roads.

The execution of this project of the Varysburg Water Company, Inc., will not in any way affect the present water supplies of any community in this State, nor is there reason to anticipate that the waters of these springs will ever be necessary to supply the inhabitants of any community other than Varysburg.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with plans and specifications which have been approved by this Commission.

2. Libby springs shall be covered by a tight house, the door of which shall be locked. The land about the spring shall be enclosed by a tight fence and cattle shall not be allowed inside thereof. A suitable outhouse shall be erected near the sugar house at this spring and in a location satisfactory to this Commission. The sanitary conditions of the surroundings of this sugar house shall at all times be satisfactory to this Commission.

3. In the event that water from Wolf springs is to be used, the works for the collection thereof shall be completely constructed in accordance with plans and specifications which have been submitted to and approved by this Commission. These plans shall provide for a tight spring house, covered and capable of being securely locked, for the control, by lease or purchase, of land about the spring and the fencing thereof and for the maintenance in proper sanitary condition of the land immediately surrounding these sprigs. The water shall not be delivered into the distribution piping until analyses thereof have been made, submitted to this Commission and this Commission has certified that the sanitary quality of the water is satisfactory, nor shall

such water be so supplied unless it be shown that the amount of hydrogen sulphide gas in the effluent from these springs is not so great as to make the water unsuitable for domestic use, including drinking, or unless satisfactory works for the elimination of this gas, by aeration or otherwise, are included in the plans. If such works are constructed they shall be at all times operated to the satisfaction of this Commission.

4. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Varysburg Water Company, Inc., as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 8th day of September, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 169

VILLAGE OF NAPLES, Ontario county.

Application filed July 6, 1914.

Hearing held at Naples, July 28, 1914.

Petition asks for approval of acquisition by village of an additional source of supply. Estimated cost, $18,000.

Hearing has been had on this application, but at said hearing the petitioner asked to be allowed to make further studies of available sources of additional supply. Decision has been withheld pending the result of these investigations.

WATER SUPPLY APPLICATION NO. 170

VILLAGE OF WAPPINGERS FALLS.

Application filed July 21, 1914.

Hearing held at Albany, July 30, 1914.

Village desires to install a complete water works system to supply water for domestic purposes and fire protection, water from gravel bed on Edward's Hill northeast of the village. Estimated cost, $75,000.

Hearing has been had and decision will be handed down at an early date.

WATER SUPPLY APPLICATION NO. 171

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter of the Application of the VILLAGE OF PALMYRA, Wayne county, N. Y., for permission to acquire by purchase the properties of the Palmyra Water Works Company.	*Decision*

Application filed August 1, 1914.
Hearing held at Palmyra, September 10, 1914.
Decision September 30, 1914.
Approved.

John K. Williamson, Edwin B. Anderson and G. Albert Tuttle, the members of the board of water commissioners of the village of Palmyra, Wayne county, acting on behalf and in the name of said village, on July 29, 1914, made application to the Conservation Commission for its approval of the proposed purchase by the village of the entire water works system of the Palmyra Water Works Company. This petition was filed in the office of the Conservation Commission August 1, 1914.

On April 30, 1914, the Commission caused the system of said company and its various sources of water supply to be inspected by one of its engineers. On September 10, 1914, this system was again inspected by Commissioner John D. Moore and one of the Commission's engineers.

After due notice published in the Palmyra *Courier, Wayne County Journal* of Palmyra and the *Wayne Democratic Press* of Lyons, a hearing was had on this petition in the justice's room in the village hall of the village of Palmyra on September 10, 1914, at 11 A. M. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project as shown by the minutes. The petitioner was represented by George S. Tinklepaugh, Esq., its attorney. No objections were filed and no one appeared in opposition.

The village of Palmyra proposes to purchase all the plant, real and personal property, rights, franchises, contracts and agreements of the Palmyra Water Works Company of Palmyra, N. Y., and thereafter to operate said water works system. In order to purchase this system it is proposed to issue village bonds in the amount of $33,000, of which amount $30,000 is to be paid to the company. The remaining sum of $3,000 is to be expended in betterments and extensions, or is to be utilized as working capital.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

Palmyra is a village in Wayne county, incorporated under the provisions of chapter 194 of the Laws of 1879, a special act. This village is located in the town of Palmyra in the southwestern portion of Wayne county, is traversed by the main line of the New York Central & Hudson River Railroad, by the West Shore Railroad and by the old Erie and the new Barge canals. In 1910 Palmyra had a population of 2,268, the present estimated population is 2,500. By the last roll the assessed valuation of all taxable property within the village was $1,361,725. This village has no outstanding bonded debt.

Palmyra Water Works Company has supplied the inhabitants of this village with water for domestic and public purposes for the last twenty-five years. In that period the mains of this company have been extended and new sources of water supply have been acquired and used. This village has grown in population and the limits thereof have recently been extended. As a result the sources of supply which now furnish water to the company are not entirely adequate for the needs of this community and additional sources must soon be obtained. At present the water works company has outstanding $50,000 in stock and a bond issue of $55,000. It is stated that the financial condition of the company is such that it is unable to make the needed improvements in and additions to its system. Therefore, the village authorities consider it necessary for the village to acquire the existing system and later to build extensions thereto and to obtain an additional source of water supply.

By resolution, duly adopted at a meeting of the board of trustees of this village held February 27, 1914, three propositions were submitted to the voters at the regular charter election for that year. These were: (1) To issue village bonds for $33,000 for the purchase and extension of the existing system. (2) To issue additional village bonds for $36,000 for the construction of additions and extensions to the system thus purchased and for an additional supply of water. (3) To authorize the formation of a board of water commissioners. These questions were voted upon at the regular election held April 7, 1914. At this election the first and third propositions were carried in the affirmative by a substantial majority, the second proposition failed to be so carried. On April 13 and April 24, 1914, the board of trustees appointed the signers of the present petition as the board of water commissioners for the village. These commissioners have duly qualified for office and entered into the exercise of their duties.

On June 29, 1914, Mr. Herbert N. Smith, president of the Palmyra Water Works Company, in a formal written instrument addressed to the water commissioners of this village, stated that he was the owner of 490 out of the outstanding 500 shares of stock of said company and that he either owned, controlled or held options on all the outstanding bonds of said company. Further, he made a formal offer to sell the entire property of said company in or near the village of Palmyra, with the exception of accounts receivable, for the sum of $30,000. On June 30, 1914, the board of water commissioners of said village adopted a resolution accepting this offer, with the proviso that a free and unincumbered title could be given to the property.

Mr. Charles C. Hopkins, a civil engineer with an office in the city of Rochester, was retained by the village board to report upon the water supply situation in this village. A copy of Mr. Hopkins' report was submitted as part of this application. The value set by him upon the system of the water works company was $33,795. Mr. Hopkins also made studies and estimates on possible additional sources of supply.

The original water works system of the Palmyra Water Works Company was constructed in 1888. The original source of supply was a well sunk into a stratum of water bearing gravel in the southeasterly portion of the village. This well is 20 feet in diameter and 23 feet deep, walled with brick and covered by a wooden roof. Adjacent to this well is a pumping station, which, in addition to an engine and boiler room, contains living quarters for the engineer, a frame coal shed and a frame barn. In the pumping station are two 40 horse-power boilers, a steam pumping engine with a capacity of 1,000,000 gallons per day and the necessary auxiliary apparatus. On a hill adjacent to this station is a riveted steel standpipe 20 feet in diameter, 50 feet high and holding 118,000 gallons. As the yield from this well proved insufficient for the growing demands of the people of the village, the company in 1900 dug another well on the bank of Henpeck creek about one-third of a mile east of the village limits. This well is about 20 feet in diameter and 13 feet deep, is walled with wood and concrete and is covered with a wooden roof. Adjacent to it is a small frame pumping station housing a triplex plunger pump, which originally was operated by steam, but which since 1911 has been driven by an electric motor. At times the water flowing in Henpeck creek is allowed to enter this well and is then sterilized with chlorinated lime, introduced by somewhat crude apparatus. Campbell spring, situated southwest of this well, is connected to it by 1,700 feet of 4-inch pipe.

The distribution system in the village streets now consists of about 33,000 feet of cast-iron pipe of from 4 inches to 8 inches in diameter and about 3,000 feet of galvanized iron pipe from ¾ of an inch to 2 inches in diameter. Sixty-one fire hydrants have been installed for the purpose of fire protection. The elevation of the standpipe is such as to give pressures of from 65 to 83 pounds per square inch in the distribution mains. The average pressure is about 74 pounds. At times water from a spring on the property of the Garlock Packing Company has been pumped by that company into the village mains. It is stated that this existing system is in fairly good condition, although the steam equipment and standpipe are old and will soon have to be replaced.

During the dry periods of past years the yield of the various sources of water supply owned by the company has not exceeded 80,000 gallons per day, or 35 gallons per capita. This is too small for the needs of a village of the size of Palmyra and it has been necessary to supplement this water by water from the Garlock spring. It seems probable that an additional supply of water is needed now and that this need will become urgent in the near future.

Analyses of water from these various sources were submitted with the application. These indicate that the ground water supplies are generally of suitable sanitary quality. An examination of the surroundings of these supplies indicates, however, that the purity of the original source is now being endangered by the encroachment of buildings and it is not improbable that it may have to be abandoned in the not distant future. The water flowing in Henpeck creek is contaminated and should be used only after sterilization. The water from Garlock spring is of unsuitable quality for domestic consumption and the use of this spring cannot be permitted unless adequate means are taken to purify this water either by filtration or sterilization.

As above stated, the purchase price of these works is somewhat less than the engineer's estimate of the value thereof.

It is reported by the engineer that the existing system, although quite badly deteriorated in some places, is still safe.

Land about the pumping stations, wells and standpipe is included as part of the system. This comprises a parcel of 2.32 acres at the steam pumping plant, a 50 foot by 50 foot plot at the standpipe, a right of way between these two for a pipe line, a square plot of one-quarter acre at the Henpeck pumping station and a right of way to the Campbell spring.

Alternative and additional sources of supply for this village undoubtedly exist, but application has not been made for any other supply at this time.

It does not appear that the purchase of this system by the village of Palmyra will in any way affect the water supply interests of any other community in this State.

The legal damages which may be caused by the execution of the plans of the petitioner do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above, the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and that filtration is at the present time unnecessary.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. No surface water from Henpeck creek shall be pumped into the mains in the village streets until such water has been sterilized in a satisfactory manner.

2. Water from Garlock spring may be used provided that, before being pumped into the distribution mains, it is purified by filtration or treated with some approved sterilizing substance. Such filtration or treatment shall be effected by the use of apparatus satisfactory to this Commission. The method of operating such apparatus and quantities of chemicals and other materials used shall be satisfactory to this Commission.

Wherefore, the Conservation Commission does hereby approve the said application of the village of Palmyra as thus modified.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 30th day of September, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 172

VILLAGE OF ST. JOHNSVILLE.

Application filed August 14, 1914.

Hearing held in Albany, September 9, 1914.

Village wishes to make available for its use a greater quantity of water from present sources of supply. To do this the present distribution reservoir is to be rebuilt and another constructed alongside thereof; new reservoir to have a capacity of 1,000,000 gallons. Estimated cost, $15,000.

Hearing has been had and decision is being prepared.

WATER SUPPLY APPLICATION NO. 173

STATE OF NEW YORK — CONSERVATION COMMISSION

In the Matter
of the
Application of the RIDGE ROAD WATER DISTRICT of Greece, N. Y.
} *Decision*

Application filed August 22, 1914.

Hearings at Rochester, September 10, and at Albany, September 14, 1914.

Decision September 29, 1914.

Approved.

Clifford E. Clark, Herbert J. Paine and William H. Anderson on July 24, 1914, made application to the Conservation Commission for its approval of the project of the applicants for the installation of a water works system in the Ridge Road water district of the town of Greece, Monroe county, N. Y., and for permission to obtain a supply of water for that district from the mains of the Rochester and Lake Ontario Water Company.

After due notice published in the *Union and Advertiser* of Rochester and the Rochester *Herald* a hearing was had on this petition in the Monroe county court house in the city of Rochester at 9 A. M., September 10, 1914, and thereafter, pursuant to adjournment, a further hearing was held in the office of the Conservation Commission in the city of Albany at 9:30 A. M., September 14, 1914. At this hearing the Commission considered the petition, maps and plans submitted, examined witnesses and heard arguments for the project, as shown by the minutes. The petitioners were represented by C. Porter Downs, Esq., their attorney. No objections to the granting of this application were filed and no one appeared in opposition thereto.

It is proposed to obtain a supply of water for the Ridge Road water district from the mains of the Rochester and Lake Ontario Water Company. One of the main supply mains of this company traverses the highway which forms the easterly boundary of the district. In the district itself it is proposed to lay 20,000 feet of 8-inch and 4,500 feet of 6-inch cast-iron piping. This pipe is to be laid as one line about 4½ miles in length with one short branch. A meter is to be set by the water company at the point of connection of the mains of the district with those of the company. Thirty double nozzle fire hydrants are to be installed in such positions as to afford fire protection to all the buildings in the district.

After due study of the petition and its exhibits, the evidence and arguments given at the hearing and the report of the engineers of the Commission, it appears as follows:

The petitioners above named are the duly appointed, qualified and acting water commissioners of the Ridge road water district of the town of Greece. A petition for the formation of said district, signed by a majority of the owners of taxable real property therein and acknowledged by them in the manner of a deed to be recorded, was filed with the town clerk of the town of Greece on July 10, 1914. Thereafter on July 22, 1914, the town board of said town of Greece duly met and made the determination on said petition and an order forming said district as required by the statutes. The order then made by the said board authorized the expenditure of $25,000 for the construction of this water works system. On the same day the town board duly appointed the petitioners herein as water commissioners of said district.

Ridge road water district is a portion of the town of Greece generally 1,000 feet in width and extending along the Ridge road in an easterly direction from the division line between the towns of Greece and Parma for a distance of about 4½ miles. At the time of the formation of this district it had an estimated population of 400 persons and the value of the taxable property therein was $300,000.

At the present time there is no public water supply system within the limits of this district. Water for domestic purposes is obtained from ordinary surface wells and, as the ground water conditions are not favorable, it frequently happens that several houses have to obtain their water from one well. This results in serious inconvenience to the inhabitants. The district is entirely without water for purposes of fire protection.

Plans of the proposed water works system, a report thereon and specifications therefor were prepared for submission to the town board by Mr. H. C.

Kittredge, a civil engineer, having an office in the city of Rochester. Copies of these plans, specifications and report were submitted with the present application to the Conservation Commission.

Rochester and Lake Ontario Water Company is a corporation engaged in supplying water for domestic, manufacturing, agricultural and public purposes to a belt of territory immediately surrounding the city of Rochester and to a portion of that city. This company obtains its water from Lake Ontario at a point east of the village of Charlotte. This water, after being purified by passing through a battery of mechanical pressure filters, is pumped to the various areas supplied by said company. The amount of water which can be furnished is limited only by the capacity of the pumps and filters. This capacity can readily be increased whenever necessity therefor arises. The company stands ready to furnish the Ridge road water district with water at the rate of fifteen cents per thousand gallons.

Although the waters of Lake Ontario near the mouth of the Genesee river are contaminated and unfit for domestic purposes without purification, this Commission has many times determined that the water supplied to the customers of the said company is safe for drinking and suitable for all ordinary purposes.

It is estimated that the proposed water supply system can be completely constructed for a sum not exceeding $25,000. It appears that this estimate is reasonable and that the system can probably be established at a cost not exceeding the funds available.

The works, if properly constructed in accordance with the plans and specifications submitted, with suitable materials and careful workmanship, will be safe and adequate. The completed system will be able to furnish the inhabitants of this district with enough water of satisfactory quality for all domestic uses and under pressures sufficiently high to give good fire protection.

All pipes and mains in the district are to be laid in public streets and roads. Therefore it is not proposed to acquire or take any land.

Lake Ontario appears to be the natural source of water supply for this district. The district could install its own works for pumping and filtering water from the lake, but only at an excessive cost.

The carrying out of the project of the applicants will not adversely affect the water supply interests of any other community in the State.

The legal damages which may be caused by the execution of the plans of the petitioners do not appear to be such as to require any special consideration or legislative enactment in order that they may be equitably determined and paid.

In consideration of the above the Commission therefore finds and determines:

First. That the plans proposed are justified by public necessity.

Second. That said plans provide for the proper and safe construction of all work connected therewith.

Third. That said plans provide for the proper protection of the supply and the watershed from contamination and for the proper filtration of such additional supply.

Fourth. That said plans are just and equitable to the other municipalities and civil divisions of the State affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply.

Fifth. That said plans make fair and equitable provisions for the determination and payment of any part of all legal damages to persons and property, both direct and indirect, which will result from the execution of said plans or the acquiring of said lands.

Provided, however, that the said application, maps and plans as submitted shall be modified and the Commission does hereby determine that they be modified and that the work done thereunder be subject to the following conditions:

1. All the work proposed in this application shall be completely constructed in accordance with the plans and specifications submitted with the petition.

2. After these works have been constructed they shall be inspected by and be subject to the approval of this Commission and such works shall not be operated until permit to do so has been issued by this Commission, as provided by section 523 of the Conservation Law.

Wherefore, the Conservation Commission does hereby approve the said application of the Water Commissioners of the Ridge Road water district of the town of Greece, in the county of Monroe.

[L. S.] IN WITNESS WHEREOF, the Conservation Commission has caused this determination and approval to be signed by the Commission and has caused its official seal to be affixed hereto and has filed the same with all maps, plans, reports and other papers relating thereto in its office in the city of Albany this 29th day of September, 1914.

CONSERVATION COMMISSION.
GEO. E. VAN KENNEN,
J. W. FLEMING,
JOHN D. MOORE,
Conservation Commissioners.

Attest: ALBERT E. HOYT,
Secretary to Commission.

WATER SUPPLY APPLICATION NO. 174

VILLAGE OF PORT HENRY.

Application filed September 17, 1914.

Village desires approval of new reservoirs proposed to be constructed to increase the available yield from present sources. All the necessary papers have not yet been filed and date for hearing has not yet been fixed.

APPENDIX B

ACTION TAKEN ON SEWERAGE APPLICATIONS
OCTOBER 1, 1913, to SEPTEMBER 30, 1914

APPENDIX B

SEWERAGE APPLICATIONS

The following is a list of all sewerage applications which have been filed or on which the Commission has taken action during the past year. The action taken on each application is shown.

No.	Applicant	Approved State Department of Health	Approved by Commission
147.	State Training School for Boys, Yorktown	Withdrawn Aug. 7, 1914	
176.	Burghardt, H. D., Whitney Point, residence	July 12, 1913	Oct. 6, 1913
180.	Herkimer, village of, disposal works	July 25, 1913	Nov. 7, 1913
184.	Eidlitz, O. M., Fourth lake, residence	Aug. 5, 1913	Oct. 6, 1913
193.	Eastwood, village of, sewerage and sewage disposal works	Aug. 23, 1913	Nov. 26, 1913
197.	Batavia, village of, fair grounds extension	Sept. 8, 1913	Dec. 16, 1913
198.	Keystone Dairy Co., South Granby, wash water.	Sept. 8, 1913	Nov. 7, 1913
201.	Irondequoit, town of, School district No 4, disposal plant	Sept. 13, 1913	Dec. 31, 1913
202.	Gedney Farm Co. Inc., White Plains hotel, disposal works	Sept. 30, 1913	Nov. 7, 1913
205.	Ogdensburg, city of, State st. sewer extension	Sept. 30, 1913	Oct. 13, 1913
206.	Poughkeepsie, city of, disposal works	Nov. 10, 1913	Nov. 26, 1913
207.	Binghamton, city of, Burton and Mason aves	Oct. 11, 1913	Oct. 20, 1913
208.	Avon, village of, Rochester and other streets	Oct. 11, 1913	Nov. 7, 1913
209.	Merrell-Soule Co., powdered milk factory, Little Valley, disposal works	Oct. 16, 1913	Nov. 26, 1913
210.	Port Chester, village of, disposal works, amendments	Oct. 16, 1913	Nov. 7, 1913
211.	Holley, village of, sewerage and sewage disposal	Oct. 16, 1913	Nov. 26, 1913
212.	Binghamton, city of, Rush ave. and Roberts st	Oct. 18, 1913	Nov. 7, 1913
213.	Mt. Kisco, village of, Mountain ave	Oct. 20, 1913	Nov. 7, 1913
214.	Watertown, city of, Cooper, Davidson, Hamilton etc	Oct. 20, 1913	Oct. 30, 1913
215.	General Electric Co., Schenectady, sewers	Oct. 22, 1913	Nov. 26, 1913
216.	Granville Improvement Co., Granville, disposal works	Oct. 23, 1913	Nov. 7, 1913
217.	Kenmore, village of, McKinley ave	Oct. 24, 1913	Nov. 26, 1913
218.	Red Hook Light & Power Co., Baker Mills, sewage disposal works	Oct. 28, 1913	Nov. 7, 1913
219.	Joffa & Perlmon, Briscoe creamery, treatment works	Oct. 28, 1913	Nov. 26, 1913
220.	Castorland Milk & Cheese Co., treatment works.	Oct. 28, 1913	Nov. 7, 1913
221.	Oneida, city of, interceptors and disposal works	Nov. 10, 1913	Nov. 26, 1913
222.	Fredonia, village of, Orchard st	Nov. 12, 1913	Nov. 26, 1913
223.	Ogdensburg, city of, Mechanic st	Nov. 12, 1913	Dec. 3, 1913

No.	Applicant	Approved State Department of Health	Approved by Commission
224.	Binghamton, city of, Moore and Maple aves	Nov. 12, 1913	Jan. 7, 1914
225.	Peekskill, village of, Crompond, Finch and other streets	Nov. 12, 1913	Nov. 23, 1913
226.	Sidney, village of, Colegrove st	Nov. 14, 1913	Dec. 3, 1913
227.	Larchmont, village of, Larchmont, Chatsworth and Monroe aves	Nov. 24, 1913	Dec. 23, 1913
228.	Huntersland Co-operative Creamery Co., Huntersland, treatment works	Dec. 2, 1913	Dec. 23, 1913
229.	Ruisseaumont sewer district, North Elba, extension	Dec. 2, 1913	Dec. 16, 1913
230.	Woodmere Club, Inc., Woodmere, L. I., sewerage and sewage disposal	Dec. 6, 1913	Dec. 16, 1913
231.	Eastchester sewer district, extensions	Dec. 12, 1913	Jan. 26, 1914
232.	Blocher Home, Williamsville, Erie county, disposal works	Dec. 12, 1913	Jan. 7, 1914
233.	Pelham sewer district	Dec. 19, 1913	Application not made
234.	Scarsdale, town of, Sewer district No 1, sewerage system	Dec. 27, 1913	Jan. 7, 1914
235.	Gedney Farm Co., Inc., White Plains, Westchester county, disposal works	Dec. 30, 1913	Feb. 2, 1914
236.	Depew, village of, extensions south of Broadway	Jan. 10, 1914	Jan. 26, 1914
237.	Goldman, Henry, town of Santa Clara, Franklin county, residence	Jan. 13, 1914	Jan. 26, 1914
238.	Goshen, village of, sewerage and sewage disposal	Jan. 13, 1914	Feb. 20, 1914
239.	Rochester, city of, interceptors, outfall and disposal works, revision	Jan. 19, 1914	Feb. 20, 1914
240.	Waterloo, village of, disposal works, revision	Jan. 19, 1914	Jan. 26, 1914
241.	Medina, village of, trunk sewer between Church and West streets	Jan. 28, 1914	Mar. 10, 1914
242.	Binghamton, city of, Mason ave. and Moeller st	Feb. 26, 1914	Mar. 10, 1914
243.	Charlotte, village of, Martin tract and Allen park, extensions	Feb. 5, 1914	Mar. 10, 1914
244.	Watertown, city of, Hewitt st., extension	Feb. 13, 1914	Feb. 20, 1914
245.	Parmenter, I. C., Clay, N. Y., residence	Feb 13, 1914	April 10, 1914
246.	Watertown, city of, extension in Clinton ave	Feb. 27, 1914	Mar. 10, 1914
247.	New Hartford, village of, connection to disposal works, of town sewer district No. 1	Mar. 5, 1914	April 6, 1914
248.	Northport, village of, sewerage and sewage disposal	Mar. 12, 1914	April 6, 1914
249.	Mount Morris, village of, revision disposal works.	Not approved Department of Health	
250.	Albany, city of, intercepting sewer	Mar. 18, 1914	April 10, 1914
251.	Binghamton, city of, Prospect st., extension	Mar. 18, 1914	April 6, 1914
252.	St. Francis Hospital, town of Poughkeepsie, disposal works	Mar. 18, 1914	April 1, 1914
253.	Greer, A. M., town of White Plains, residence	Mar. 18, 1914	April 10, 1914
254.	Peekskill, village of, Walnut st	April 29, 1914	May 13, 1914

No.	Applicant	Approved State Department of Health	Approved by Commission
255.	Mutual Milk & Cream Co., South Gilboa, treatment works	April 6, 1914	May 13, 1914
256.	Moulton, W. A., Clay, N. Y., wastes from pickle factory, treatment works	April 10, 1914	May 13, 1914
257.	Dunkirk, city of, Newton st. and Washington ave	April 17, 1914	May 13, 1914
258.	Fredonia, village of, sewerage system and disposal works	April 18, 1914	May 13, 1914
259.	Binghamton, city of, Linden and other streets	April 18, 1914	May 19, 1914
260.	Brighton, town of, sewer district No. 1, sewerage and sewage disposal	April 29, 1914	May 13, 1914
261.	Oneida, city of, disposal plant	April 29, 1914	Sept. 9, 1914
262.	Greece, town of, sewer district No. 1, sewerage and sewage disposal	April 29, 1914	May 19, 1914
263.	Binghamton, city of, Robinson st., extension	May 4, 1914	May 19, 1914
264.	Medina, village of, Oak Orchard and other streets	May 21, 1914	June 16, 1914
265.	Oneida Community, Ltd., Kenwood and Sherrill	May 21, 1914	June 16, 1914
266.	Hudson Falls, village of, Weston ave. and Sarver st	May 21, 1914	Withdrawn
267	Lyons, village of, sewerage and sewage disposal	May 21, 1914	June 16, 1914
268.	Bonsted, H. T., hotel at Clay, disposal works	June 6, 1914	Sept. 9, 1914
269.	Fort Stanwix Canning Co., Waterville, wastes, treatment works	June 16, 1914	Application not made
270.	State Reformatory for Women, Bedford Hills	May 14, 1914	July 16, 1914
271.	Old Forge, village of, sewerage and sewage disposal	June 27, 1914	Application not made
272.	Binghamton, extensions in Haendel st	June 30, 1914	July 16, 1914
273.	Stern, Benjamin, residence near Roslyn, disposal works	June 30, 1914	July 16, 1914
274.	Olean, city of, extensions in Kittanning ave. and East River road	June 30, 1914	Application not made
275.	Peekskill, village of, extension in Orchard st	June 30, 1914	July 10, 1914
276.	Scarsdale, sewer district No. 1, extension in Rochambeau road	July 1, 1914	July 16, 1914
277.	Tonawanda, city of, Highland district sewers	July 8, 1914	Aug. 11, 1914
278.	State School of Agriculture, Farmingdale, L. I., sewerage and sewage disposal	July 10, 1914	July 16, 1914
279.	Watertown, city of, extensions in North and South Hamilton sts. and railroad right of way	July 14, 1914	Aug. 11, 1914
280.	Yorkville, village of, extensions in Maynard ave. and elsewhere	July 14, 1914	Aug. 11, 1914
281.	West Seneca, town of, sewer district No. 1, sewerage system	July 14, 1914	Aug. 11, 1914
282.	Sloan, village of, sewerage and sewage disposal	July 16, 1914	Aug. 11, 1914
283.	Craig Colony for Epileptics, Sonyea, revised disposal works	July 16, 1914	Aug. 11, 1914

No.	Applicant	Approved State Department of Health	Approved by Commission
284.	Wayne County Canning Co., Ltd., Marion, sewage disposal	July 17, 1914	Sept. 21, 1914
285.	Binghamton, city of, Conklin ave., Field and Bethoven sts	July 28, 1914	Aug. 11, 1914
286.	Watertown, city of, East Division st	July 28, 1914	Sept. 21, 1914
287.	Unadilla, village of, Martin Brook st	July 28, 1914	Aug. 11, 1914
288.	Gowanda, village of, Orchard place	July 28, 1914	Aug. 11, 1914
289.	Rickert-Finlay Realty Co., Water Front Park Property, Kensington, sewage disposal plant	July 28, 1914	Aug. 11, 1914
290.	Port Chester, village of, intercepting sewer and disposal works, amended plans	July 28, 1914	Sept. 21, 1914
291.	Henderson Butter & Cheese Factory, Henderson, wastes, treatment works	Aug. 20, 1914	Application not made
292.	Weller, J. Co., Kraut and Pickle Factory at Clay, wastes, treatment works	Aug. 20, 1914	Sept. 9, 1914
293.	Schenectady, city of, disposal works, amended plans	Aug. 20, 1914	Sept. 9, 1914
294.	Lyons, village of, disposal works, amended plans.	Aug. 20, 1914	Application not made
295.	Wayne County Milk Products Co., Ontario Center, wastes	Aug. 20, 1914	Application not made
296.	DeLisser, H., Great Neck, sewage disposal	Aug. 25, 1914	Sept. 21, 1914
297	Adam, J. N. Hospital, Perrysburg, additional disposal works	Aug. 31, 1914	Sept. 21, 1914
298.	Port Henry, village of, sewer in Mill st	Aug. 31, 1914	Application not made
299.	Manning, John A. Paper Co., wastes from mill in Green Island	Aug. 31, 1914	Sept. 9, 1914
300.	Binghamton, city of, intercepting sewer along Chenango river	Aug. 31, 1914	Sept. 9, 1914
301.	Stone School, Cornwall-on-Hudson, reconstruction and extension of disposal plant	Sept. 2, 1914	Application not made
302.	Niskayuna, town of, Sewer district No. 2, sewerage	Sept. 4, 1914	Sept. 21, 1914
303.	Depew, village of, sewage disposal works	Sept. 10, 1914	Application not made
304.	Westfield, village of, extensions in Jackson and other sts	Sept. 10, 1914	Application not made
305.	Auburn, city of, sewers in Arlington and other streets	Sept. 10, 1914	Sept. 29, 1914
306.	Talcottville Cheese, Butter, Milk & Cream Co., Talcottville, disposal works	Sept. 21, 1914	Sept. 29, 1914
307.	Ogdensburg, city of, Covington and other streets.	Sept. 30, 1914	Application not made

APPENDIX C

HYDROMETRIC REPORT

APPENDIX C

PROGRESS REPORT ON HYDROMETRIC WORK CARRIED ON IN CO-OPERATION WITH THE UNITED STATES GEOLOGICAL SURVEY

By C. C. COVERT, District Engineer, U. S. Geological Survey

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

WATER RESOURCES BRANCH

ALBANY, N. Y., *January* 25, 1915

HON. GEO. E. VANKENNEN, *Chairman, State of New York Conservation Commission, Albany, N. Y.:*

DEAR SIR.— I have the honor to submit herewith a report on the co-operative hydrometric work carried on between the United States Geological Survey and the Conservation Commission during the fiscal year ended September 30, 1914.

The report has been prepared by Mr. O. W. Hartwell, office engineer, assisted by the several junior engineers whose names appear in the body of the report, all of the United States Geological Survey force, Albany office.

The special investigations for computing the discharge of Saranac river near Plattsburg and Indian lake reservoir were completed by Mr. C. H. Pierce, assistant engineer.

Conferences have been held with Hon. John D. Moore, Commissioner of Inland Waters, your chief engineer, Mr. Richard W. Sherman, and his assistant engineers. Careful consideration has been given to the special requirements of the Commission and efforts have also been made to collect data that will be of value to the general public. The results of the year's work are respectfully submitted.

Very truly yours,

C. C. COVERT,

District Engineer.

HYDROMETRIC REPORT

By

C. C. COVERT, District Engineer, U. S. Geological Survey

Prepared in Co-operation with the United States Geological Survey

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HYDROMETRIC REPORT

By C. C. COVERT, District Engineer, U. S. Geological Survey

SCOPE OF INVESTIGATIONS

During the fiscal year ending September 30, 1914, the hydrometric work has in general been continued as outlined in previous annual reports of the Commission. At the beginning of the year the work was planned in accordance with the appropriations and was carried on within the limits of the funds provided therefore, which were as follows:

Conservation Commission	$10,000
State Engineer and Surveyor	1,500
U. S. Geological Survey	2,500

The report herewith submitted is for the climatological rather than the calendar year, and covers the period from October 1, 1913, to September 30, 1914, a period which in New York coincides with the State fiscal year. The tables of gage height, discharge, and rainfall are published in accordance with this scheme and, unless otherwise stated, cover the same period.

This report contains records from forty or more stream flow stations and from thirty-five rainfall stations. The estimates of stream flow for nearly every station are based on very complete ratings. It was found necessary during the past year to make new ratings at a number of the stations because of shifting channel conditions. The severe winter conditions that obtained from January to March, 1914, resulted in the formation of heavy ice throughout the entire length of many streams. Consequently, when the ice started to move in the spring, a considerable amount of scouring of the stream bed resulted. In some instances the scouring of the bed above the station was deposited at the control for the gage, thus causing a back water effect. In other cases the trouble started by a scouring out of the control which had the effect of lowering the gage height without decreasing the discharge of the stream. Sometimes a change in control affects only the low water portion of a curve; at other times, only the high water portion. In either case it is always necessary to re-rate at least a portion of the curve.

While the twelve recording gages which have been installed have given us better records, there have been times at nearly every station when the recording gage has been out of commission, and for this brief period the value of the record has been somewhat impaired. Two stations were equipped with recording gages during the year, one on Chenango river near Chenango Forks; the other on Susquehanna river at Conklin.

The field investigations necessary for developing curves of discharge through the gates of the dam on Indian river near Indian lake and through the turbines of the Indian Rapids power plant on Saranac river near Plattsburg have been completed and as a result of this work, monthly estimates of discharge have been computed for Indian lake from October, 1900, to October, 1914, inclusive, and for the Saranac from October, 1908, to October, 1914, inclusive. These tables of monthly discharge are included in this report.

During the period of ice conditions in the State, it is a much more difficult matter to obtain records of stream flow. The relation between gage height and discharge which obtains during the open period is almost entirely destroyed. It therefore becomes necessary to obtain frequent discharge measurements in addition to the daily gage height and temperature record. Because of this extra field work the funds available make it necessary to reduce the number of stations operated. During the winter of 1913–14, the following stations were maintained:

Hudson River at North Creek
Hudson River at Spier Falls *
Indian River near Indian Lake
Schroon River at Riverbank
Sacandaga River at Hadley *
Mohawk River at Vischer's Ferry*
Alplaus Kill near Charlton *
East Branch of Delaware River at Fish Eddy
West Branch of Delaware at Hale Eddy
Susquehanna River at Conklin
Chenango River near Chenango Forks
Little Tonawanda Creek at Linden
Genesee River at St. Helena *
Genesee River at Rochester *
Owasco Outlet near Auburn *
Black River near Boonville
Middle Branch Moose River at Old Forge
Oswegatchie River near Ogdensburg
Raquette River at Piercefield *
Saranac River near Plattsburg
Ausable River at Ausable Forks.

The stations marked with an asterisk are provided with recording gages and continuous records of gage heights were obtained in most cases. In addition to the gage height records, temperature records were received from a number of the stations and special efforts were made to determine the actual backwater effect at each station as a result of the ice formation. The increased care in obtaining the field data at these few stations during the winter undoubtedly makes it possible to provide estimates of flow that are much more reliable than those obtained under former methods. It is therefore considered that records from a few stations fairly representing the various types of drainage basins throughout the State give more reliable and serviceable data than would a larger number of stations from which less accurate results might be obtained.

ACKNOWLEDGMENTS

Acknowledgment is due to Hon. John A. Bensel, State Engineer and Surveyor, for the privilege of publishing in this report, records from stations that are maintained in co-operation with his department.

Acknowledgments due private parties in connection with particular stations are included in the descriptions for those stations.

DEFINITION OF TERMS

The volume of water flowing in a stream — the "run-off" or "discharge" — is expressed in various terms, each of which has become associated more or less definitely with a certain class of work. These terms may be divided into two groups — (1) those which represent a rate of flow, as "Second-feet," "gallons per minute," "gallons per 24 hours," "miner's inches" and "run-off in second-feet per square mile," and (2) those which represent the actual quantity of water, as "run-off in depth in inches," "million gallons," "cubic feet," and "acre-feet." The units used in this report are "second-feet," "second-feet per square mile," "run-off depth in inches" and "million gallons." They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and represents the rate of discharge of water flowing in a channel one square foot in cross section at a rate of one foot per second. It is generally adopted as the fundamental unit in the measurement of flowing water and is the "natural" unit, as the foot and second are the units used in making the physical determinations. Other units may be computed from this by the use of factors given in the table of equivalents.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off depth in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed over the surface. It is used for comparing run-off with rainfall, which is usually expressed as depth in inches.

CONVENIENT EQUIVALENTS

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet per square mile into run-off in depth in inches over th area

DISCHARGE IN SECOND-FEET PER SQUARE MILE	RUN-OFF IN INCHES				
	1 day	28 days	29 days	30 days	31 days
1	0.03719	1.041	1.079	1.116	1.153
2	.07438	2.083	2.157	2.231	2.306
3	.11157	3.124	3.236	3.347	3.459
4	.14876	4.165	4.314	4.463	4.612
5	.18595	5.207	5.393	5.578	5.764
6	.22314	6.248	6.471	6.694	6.917
7	.26033	7.289	7.550	7.810	8.070
8	.29752	8.331	8.628	8.926	9.223
9	.33471	9.372	9.707	10.041	10.376

NOTE.— For partial month multiply the values for one day by the number of days.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet.

1 second-foot for one day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for 1 day.

1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

1,000,000 United States gallons per day equals 1.55 second-feet.

100 United States gallons per minute equals 0.223 second-foot.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.

1 square mile equals 2.59 square kilometers.

1 cubic foot equals 0.0283 cubic meter.

1 cubic foot of water weighs 62.5 pounds.

1 cubic meter per minute equals 0.5886 second-foot.

1 horsepower equals 550 foot-pounds per second.

1 horsepower equals 76.0 kilogram-meters per second.

1 horsepower equals 746 watts.

1 horsepower equals 1 second-foot falling 8.80 feet.

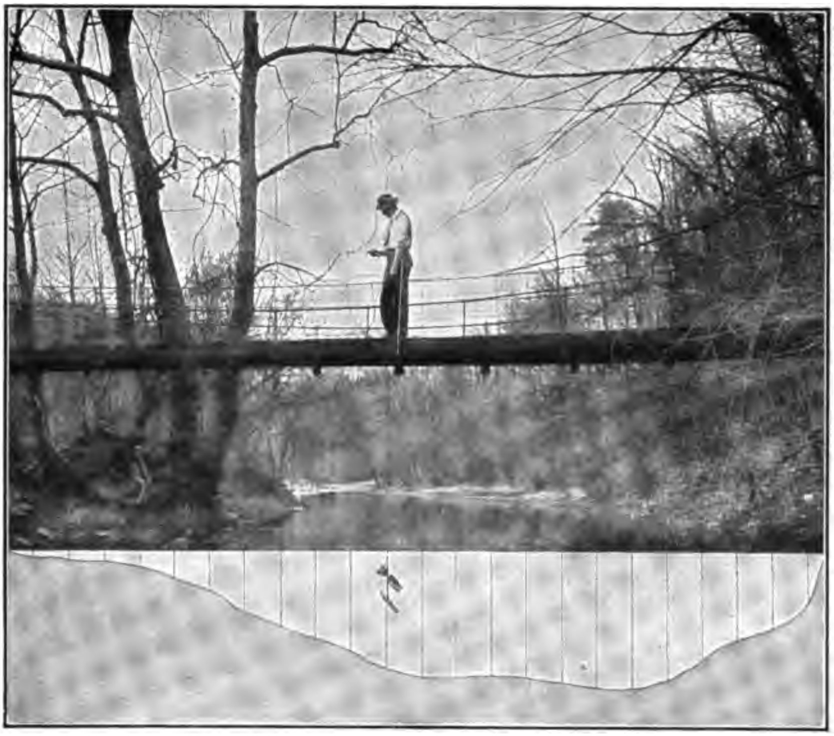
$1\frac{1}{3}$ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA

The stations discussed in this report are considered in order downstream. Records for all stations on the main river from its source to its mouth are presented first, and records for its tributaries in regular order, from source to mouth, follow, all records for each tributary drainage basin being given before those of the next basin below.

For each drainage basin there is given a brief general description covering such items as area, source, tributaries, topography, geology, forestation, rainfall, irrigation, storage, power, and other interesting or important facts.



a. For Bridge Measurement

b. For Wading Measurement
TYPICAL GAGING STATIONS

For each regular current-meter gaging station the following data, so far as available, are given: Description of station, list of discharge measurements, table of daily gage heights, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located at dams the gage-height table is usually omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such factors as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, gage height in feet, and discharge in second-feet.

The table of daily gage heights records the fluctuations of the stage of the river as found from the mean of the gage readings taken each day. At stations not equipped with recording instruments, the gage is usually read by the observer in the morning and in the evening. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams, or by backwater from obstructions, are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general, the zero is located somewhat below the lowest known flow, so that the readings shall not be negative value.

The discharge measurements and gage heights are the base data from which rating tables, daily-discharge tables, and monthly-discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. Rating tables are not published in this report, but if desired for the purpose of verifying the published results they can be made from the daily gage heights and daily discharge as follows:

First plot the discharge measurements for the current and earlier years on cross-section paper with gage heights in feet as ordinates and discharge in second-feet as abscissas. Then tabulate a number of gage heights taken from the daily gage-height table for the complete range of stage given and the corresponding discharge for the days selected from the daily-discharge table, and plot the values on cross-section paper. The last points plotted will define the rating curve used and will lie among the plotted discharge measurements. After drawing the rating curve, a table can be developed by scaling off the discharge in second-feet for each tenth foot of gage height. These values should be so adjusted that the first differences shall always be increasing or constant, except for known conditions of backwater.

The table of daily discharge gives the discharge in second-feet corresponding to the observed gage heights as determined from the rating tables.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the assumed mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum," the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly used at current-meter gaging stations and described in standard text books.

Plates C and D show typical gaging stations. Plate E shows current meters used in the work.

ACCURACY AND RELIABILITY OF DATA

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging station and on the methods and care with which the data are collected. Errors of the first group depend upon the degree of permanency of channel and of permanency of the relation between discharge and stage.

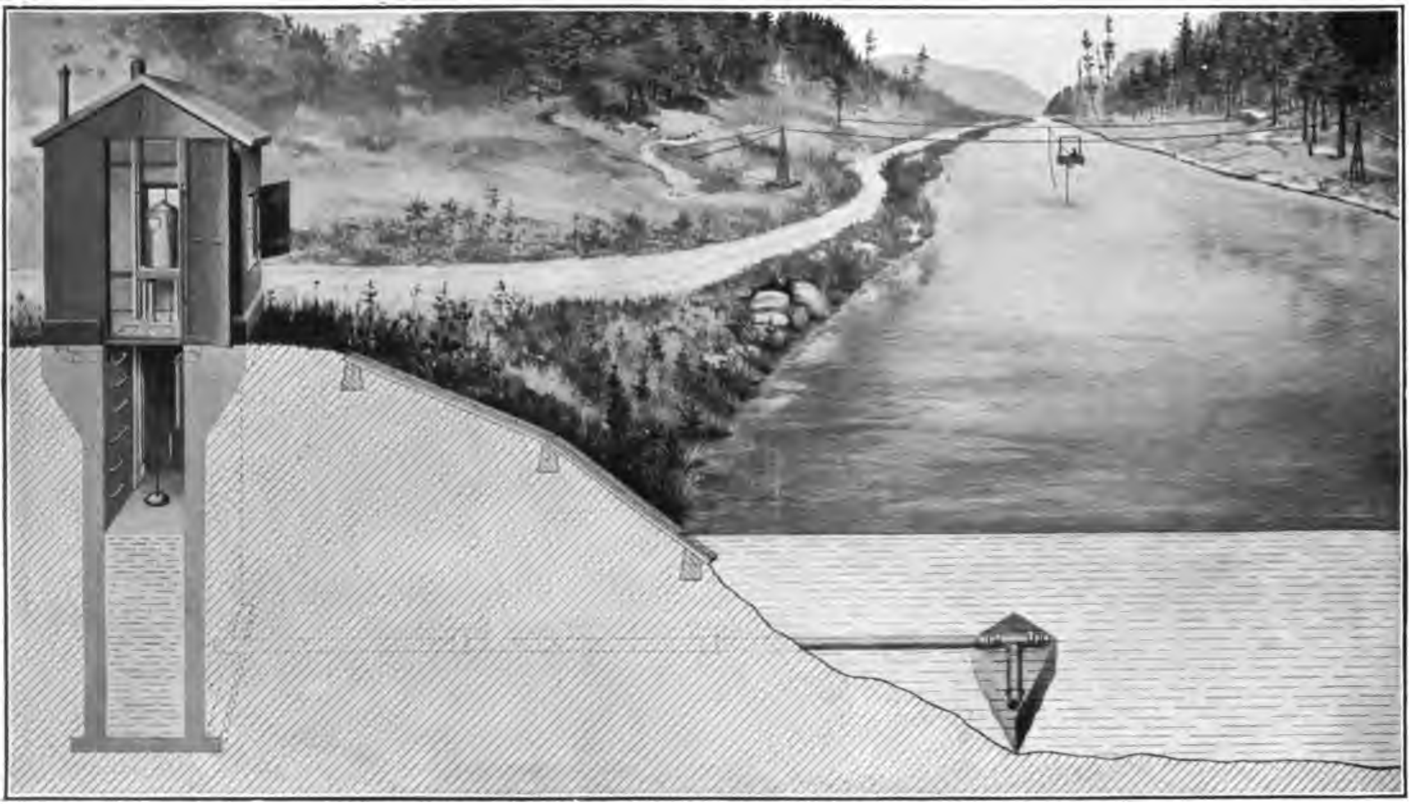
Errors of the second class are due, first, to errors in observation of stage; second, to errors in measurements of flow; and third, to errors due to misinterpretation of stage and flow data.

The accuracy column in the monthly-discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent.; B, within 10 per cent.; C, within 15 per cent.; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to errors, which result from including in the measured drainage area some noncontributing districts or omitting estimates of water diverted for municipal supplies or other purposes, and they should, therefore, be considered as only approximate, particularly for winter periods or low water. For these errors it is as a rule not feasible to make adequate correction.

The table of monthly discharge is so arranged as to give a general idea of the flow at the station, but should be used only for preliminary estimates. The computations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in this report should familiarize himself with the conditions under which they were collected before attempting to draw conclusions for periods other than those covered by the data.



Cross Section of Typical Gaging Stations

HUDSON RIVER DRAINAGE BASIN

The Main Stream

The principal sources of Hudson river lie in the wildest portion of the Adirondack mountains, in Essex county, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of-the-Clouds, which lies at an elevation of 4,322 feet above tide, in the centre of the triangle formed by Mount Marcy and Skylight and Gray peaks.

The river flows rather irregularly southward until it reaches the northern boundary of Saratoga county, where it makes a sharp turn and flows eastward for about 12 miles, passing through the mountains and forming, as it cuts across the rocky strata, several falls of great height and beauty. At Hudson Falls, just below Glens Falls, it makes another abrupt turn and flows southward, continuing in this direction until it empties into New York bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The total area drained is 13,366 square miles. The river is tidal to Troy, which is also at the head of navigation.

The headwater region is mountainous in character, is in general heavily wooded, and is dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granitic, are either bare or covered only with a layer of spruce duff, humus, and forest litter. The river emerges from the mountain region a few miles west of Glens Falls, and thence to Troy the topography is moderately rolling and the soil is chiefly sand. Below Troy the river follows the great depression which extends almost due north and south between New York bay and the St. Lawrence, flowing in an open valley bordered by well-cultivated lands, which rise with moderate slope from the stream. The Catskill Mountain region is reached 20 or 30 miles below Albany, and thence to the mouth of the river the immediate valley is flanked by high hills, the Highlands of Orange county, and the precipitous Palisades being especially noticeable.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to the mouth of North creek, a distance of about 52 miles. From the mouth of North creek to the mouth of the Sacandaga the descent is nearly 14 feet per mile, distributed among rapids which diminish in frequency as the Sacandaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more. One hundred and seventy-five feet is comprised within the three abrupt pitches at Palmer, Glens, and Bakers Falls, while most of the remainder occurs in the rapids between Jessup's Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water power.

The tributaries of the Hudson are numerous, and many of them are large and important. Indian river, Schroon river, and the Sacandaga unite with the main stream above Glens Falls, and between the latter point and Troy it receives Batten Kill, Fish creek, Hoosic river, and the Mohawk, the latter having several important tributaries, including West and East Canada and Schoharie creeks. The tributaries below Troy include Catskill, Esopus, and

Rondout creeks, and Wallkill river from the west, and Kinderhook creek, Jansen Kill, Wappinger creek, Fishkill creek, and Croton river from the east.

The mean annual precipitation on the total basin of the Hudson is probably about 43 inches. It reaches a maximum of more than 55 inches in the heights of the Adirondacks, while in the eastern portion of the drainage area in southern Vermont, the mean annual total is only about 39 inches. Conditions during the winter period vary from the extreme cold and deep snow of the Adirondacks to the areas in the southern portion of the basin which are subject to frequent winter thaws.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian Lake storage reservoir, and the natural storage facilities in the Adirondack region are unsurpassed, there being a great many ponds and lakes, many of large size and fed from extensive drainage areas. Comprehensive plans for vast storage projects on the Sacandaga, Schroon, and upper Hudson are receiving the attention of the State of New York Conservation Commission. It is probable that on the various tributaries of the Hudson an increase in storage capacity of some 75,000,000,000 cubic feet is possible, and if this were developed the Hudson would be probably the most important water-power stream in the country. While a large amount of power has been developed in the Hudson drainage area there are vast quantities as yet unutilized, and the importance of this river basin is apparent, when it is considered that in proportion to its size it contains a greater population than any other important drainage basin in the United States with the single exception of that of the Delaware river.

The longest run-off record in the Hudson river drainage basin is that obtained at Mechanicville, which extends back to 1888.

THE PRINCIPAL TRIBUTARIES[1]

Schroon River

Schroon river rises in Essex county, along the southern slopes of the highest mountains in the Adirondack group, flows in a general southerly direction for about forty-five miles through Essex and Warren counties, and joins the Hudson near Thurman. Its total drainage area is 550 square miles. Its headwaters reach an elevation of about 2,000 feet above mean tide; its mouth is at an elevation of about 600 feet.

Its basin is largely forested and contains considerable wild land and numerous lakes and ponds. The most important of these is Schroon lake, through which the river flows, which has a water surface area of about 6.3 square miles. The river affords excellent opportunities for storage and power development, which are under investigation by the New York State Conservation Commission. The only power plants are at Warrensburg.

Sacandaga River

Sacandaga river is formed by three principal branches which unite in the southeastern part of Hamilton county in the Adirondack region. The west branch is the outlet at Piseco lake, the middle branch is the outlet of Sacandaga and Pleasant lakes, the east and principal branch issues from a series of small ponds and lakes in the southwestern part of Warren county. The

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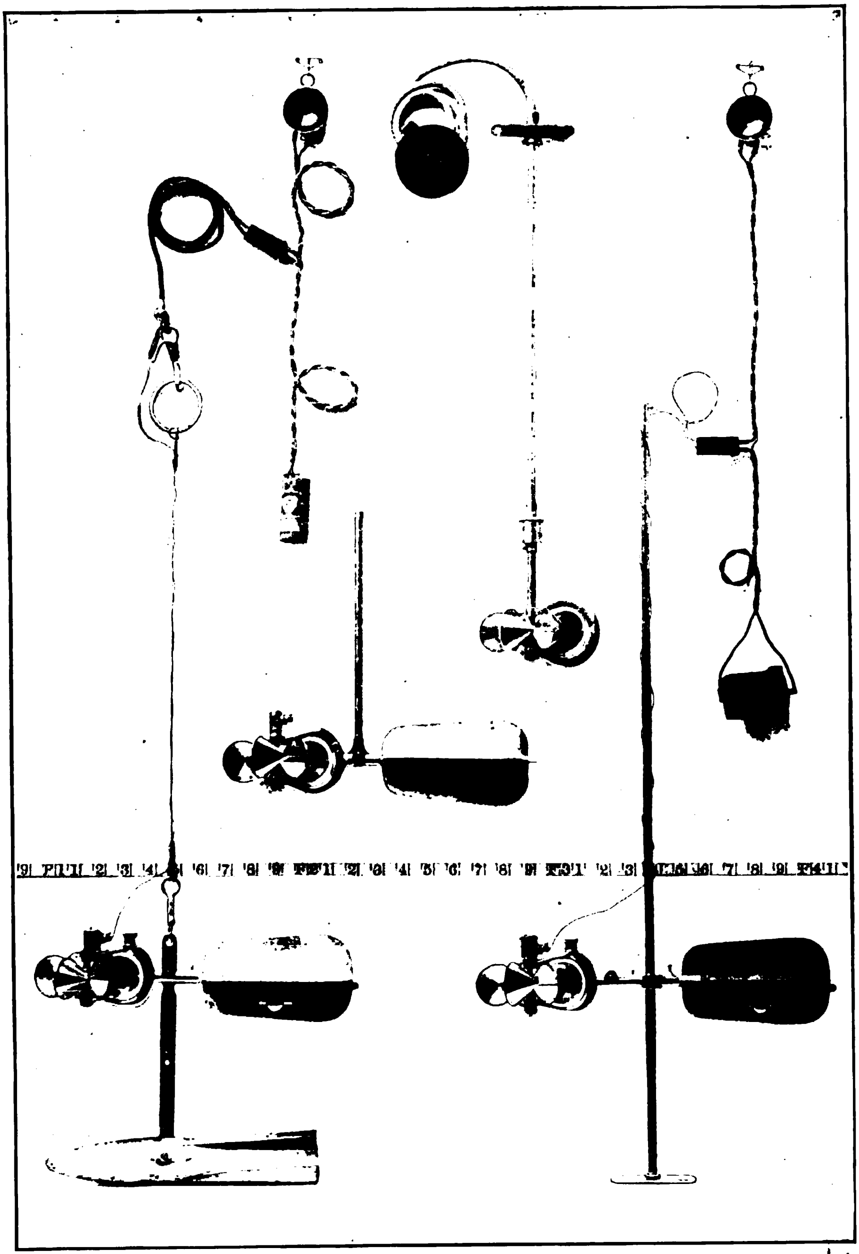
[1] The tributaries here described include only those for which records are presented.



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east and middle branches unite a few miles north of Wells and are joined by the west branch a short distance below Wells. The river then flows southeasterly to a point about five miles below Northville, where it turns and runs northeasterly to the Hudson river at Hadley. Its total drainage area comprises about 1,060 square miles.

Sacandaga lake, the highest of the tributary lakes in the headwaters, is about 1,700 feet above mean tide; at its entrance into the Hudson the Sacandaga is at an elevation of about 550 feet. Between Northville and the mouth of the river there is a fall of about 180 feet (chiefly concentrated in the five miles below Conklingville) entirely unutilized. There are, in fact, no power developments on the Sacandaga.

The drainage area of this river is largely in forest. The mean precipitation is high, being about 49 inches, whereas the mean for the whole Hudson drainage area above Mechanicville is only about 43 inches. Possibilities for storage on the Sacandaga are great, and the New York State Conservation Commission proposes a high dam at Conklingville, the reservoir to store about 29,000,000,000 cubic feet of water, with a water surface of 42.7 square miles, and controlling practically the entire flow of the Sacandaga basin. This plan proposes also to develop the total fall obtained between Conklingville and the Hudson — approximately 200 feet — which will afford 25,000 to 30,000 continuous horsepower.

Hoosic River

Hoosic river rises on the west slope of the Hoosac mountains in Vermont and Massachusetts. Two head branches, one flowing southward and the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson three miles north of Mechanicville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement, and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but one storage reservoir — at Farnam, near the head of the South Branch.

South of Hoosic river the State boundary follows the Taconic ridge, which forms the divide between the Hoosic in Massachusetts and the Little Hoosic in New York.

Mohawk River

Mohawk river, the largest tributary of the Hudson, rises in the sandy hills south of Boonville, in western New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs. The river receives also considerable water brought in from the adjacent Black River drainage basin for the supply of Black river and Erie canals. The Mohawk flows southward until it reaches the city of Rome, at which point it turns toward the east, flowing across the State in a course nearly east until it enters the Hudson at Cohoes, a few miles above Troy. Its total length is about 140 miles, and its drainage area comprises 3,470 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, and the flats which border the stream have a rich alluvial soil, finely adapted to the raising of grass, grains, and broom corn. Back from the flats there is a rise, in most places gradual but locally abrupt, to hills which attain altitudes several hundred feet above the stream. The more elevated lands are covered with sandy and gravelly loam. Toward the mouth of the river the valley becomes more contracted and the meadows disappear.

Above Rome the Mohawk flows through a deep gorge in shale rock. From Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome the river has a small and rather uniform fall and is characterized by long, quiet reaches with slight riffles, but at Little Falls this uniformity is broken and the stream descends in a succession of falls about 45 feet in half a mile. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a farther descent of 149.5 feet in 4.4 miles, but of this 105 feet is included within the improved power at Cohoes.

The Erie canal parallels Mohawk river and derives a part of its water supply from it. The new barge canal, at present under construction by the State of New York, will utilize by canalization the greater portion of the river between Albany and Utica. The water supply for the new canal in the section between Syracuse and Utica will to a large extent come from the Mohawk. A high dam has been constructed across the Mohawk at Delta, 6 miles north of Rome, for the purpose of creating a reservoir to store water for the canal. The capacity is 2,750,000,000 cubic feet. It is expected that this will be sufficient to supply the summit level of the canal with 435 cubic feet per second during the season of low rain-fall. This supply will be supplemented by a reservoir of 3,400,000,000 cubic feet capacity, on West Canada creek at Hinckley, discharging by a conduit into Ninemile creek and thence to the Rome summit level.

Important tributaries of the Mohawk are West and East Canada and Schoharie creeks.

West Canada creek rises in West Canada lake, in southwest-central Hamilton county and flows in a southerly direction into the Mohawk at Herkimer. Its drainage area, comprising approximately 583 square miles, contains about 50 small lakes and ponds and a small amount of artificial storage, which, with the numerous swamps and marshes in the region of the headwaters, serve to make the regimen of flow fairly uniform. A considerable part of the basin is timber covered. The underlying rock is granitic gneiss in the upper portion of the basin, with limestone in some places. Heavy accumulations of snow occur during the winter. At Trenton Falls is an important plant of the Utica Gas & Electric Co. There is much undeveloped power on this stream.

East Canada creek rises in Hamilton county and flows southward between Herkimer and Fulton counties, joining the Mohawk at East Creek. In a general way its drainage basin is similar to that of West Canada creek, although its flow is less sustained and regular.

Schoharie creek has its source in the Catskills, about 2 miles east of Tannersville, at an elevation of 1,940 feet. The drainage basin is generally irregular. In places its slopes are almost precipitous, and it is extensively forest covered. The overlying rocks are slaty and allow but a slight depth of percolation. The soil is generally of clay. The total drainage area is 909 square miles.

Kinderhook Creek.

Kinderhook creek is an interstate stream, with a drainage area of 337 square miles, having its source in the Hancock mountains in western Massachusetts, at an elevation of nearly 1,500 feet above tide, flowing southwestward through Columbia and Rensselaer counties, N. Y., and joining Claverack creek, about two miles from Hudson river, to form Stockport creek, through which it discharges into the Hudson, four miles north of the village of Hudson. Kinderhook creek is an important stream for power, with considerable amounts unutilized, and affords also some opportunities for storage.

STATION RECORDS

HUDSON RIVER AT NORTH CREEK, N. Y.

Location.— At the highway bridge in the village of North Creek, immediately above the mouth of North creek.

Records available.— September 21, 1907, to September 30, 1914.

Drainage area.— 804 square miles.

Gage.— Chain, read twice daily; datum, unchanged.

Control.— Heavy gravel; considered fairly permanent.

Discharge measurements.— Made from the two-span steel highway bridge.

Regulation.— The numerous lakes and ponds in the basin of the upper Hudson have a decided effect on the low-water flow; especially is this true of Indian lake. The use of these storage reservoirs in the spring in connection with log driving makes the daily records somewhat uncertain.

Winter flow.— Discharge relation affected by ice. This effect varies gradually after the ice cover is formed and can be determined by frequent discharge measurements.

Accuracy.— Discharge rating curve well defined. Determinations of discharge for open-water periods considered good.

Discharge measurements of Hudson River at North Creek, N. Y., during the year ending Septembe 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
[e] Dec. 31	C. S. De Golyer	2.78	479
1914			
[a] Jan. 13	do	3.37	442
[b] 26	do	3.93	656
[c] Feb. 3	R. S. Barnes	4.08	814
[b] 16	W. S. Eastorly	4.20	687
[d] Mar. 9	R. S. Barnes	4.46	728
April 28	C. S. De Golyer	6.11	6,380
May 4	do	4.79	3,460
4	do	4.77	3,540
Sept. 14	E. D. Burchard	3.12	1,100

[a] Measurement made through ice about 1,500 feet above gage.
[b] Measurement made through ice about 200 feet below gage.
[c] Measurement made through ice about 150 feet below gage.
[d] Measurement made through ice about 300 feet below gage.
[e] Measurement made from bridge and through ice.

Daily gage height, in feet, of Hudson River at North Creek, N. Y., for the year ending September 30, 1914

[Gordon Alexander, observer.]

DAY.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
1......	2.5	3.5	2.8	......	4.1	4.3	4.4	6.7	2.6	4.6	2.85	3.2
2......	2.65	3.5	2.75	......	4.1	4.4	4.6	6.3	2.6	5.5	2.85	3.05
3......	2.9	3.05	2.8	......	4.1	4.4	4.6	4.7	2.6	4.1	2.85	2.9
4......	3.0	2.7	2.85	......	4.0	4.5	4.4	4.6	2.5	3.3	2.85	2.75
5......	2.95	2.6	2.9	......	4.0	4.4	4.3	5.3	2.75	3.55	2.8	2.6
6......	2.9	2.55	2.8	......	4.0	4.5	3.95	5.2	2.65	4.5	2.8	2.6
7......	2.8	2.55	2.8	......	4.1	4.5	3.7	5.8	2.7	3.95	2.8	2.6
8......	2.75	2.46	3.0	......	4.0	4.5	3.8	5.3	2.7	2.85	3.0	2.6
9......	2.7	3.4	3.05	......	4.0	4.5	4.8	4.2	2.6	2.8	3.1	2.6
10......	2.7	6.0	3.3	......	4.0	4.5	4.8	5.2	2.7	2.7	3.0	3.0
11......	2.7	5.6	3.1	......	4.0	4.5	4.7	4.4	2.5	2.7	3.0	3.1
12......	2.7	5.3	2.95	......	4.0	4.5	4.5	4.2	2.46	3.4	3.0	3.05
13......	2.7	4.3	3.0	3.4	4.0	4.5	4.3	3.55	2.42	3.55	3.0	3.05
14......	2.7	3.9	2.9	3.65	4.2	4.4	4.0	3.1	2.38	3.15	3.0	3.1
15......	2.65	3.7	2.9	3.8	4.2	4.5	4.3	3.5	2.28	3.0	3.0	3.1
16......	2.6	3.5	2.9	3.9	4.2	4.5	4.3	3.4	2.75	2.9	3.0	3.1
17......	2.6	3.3	2.8	3.9	4.2	4.5	4.6	3.15	2.75	2.9	3.0	3.05
18......	2.6	3.15	2.8	3.85	4.2	4.5	4.9	3.65	2.4	3.0	3.0	3.05
19......	2.55	3.0	2.65	3.8	4.3	4.5	6.4	3.05	2.28	3.1	3.0	3.0
20......	2.75	3.3	2.65	3.85	4.5	4.5	9.4	3.0	2.45	3.1	3.1	3.0
21......	3.25	4.2	2.9	3.9	4.5	4.5	8.9	3.75	2.35	3.1	3.15	3.0
22....	3.45	4.1	3.15	3.9	4.5	4.4	7.8	2.9	2.42	3.0	3.15	3.0
23......	3.4	3.8	3.15	3.9	4.5	4.4	6.8	3.05	2.38	3.0	3.15	3.0
24......	3.25	3.55	2.95	3.9	4.4	4.3	6.0	4.5	2.3	2.95	3.15	3.0
25......	3.0	3.4	2.65	3.95	4.4	4.4	5.7	2.85	2.3	2.95	3.15	3.0
26......	3.05	3.45	2.6	3.95	4.4	4.4	5.8	3.45	2.4	2.9	3.1	3.0
27......	3.45	3.15	2.55	3.95	4.4	4.6	6.4	3.4	2.6	2.9	3.1	3.0
28......	3.35	3.05	2.38	4.0	4.4	5.2	7.0	4.3	2.65	2.9	3.1	3.0
29......	3.15	2.85	2.6	4.0	......	5.9	7.3	2.9	2.7	2.9	3.15	3.0
30......	3.1	2.95	2.75	3.95	......	6.0	7.6	2.75	2.8	2.9	3.15	3.0
31......	3.05	......	2.75	4.0	......	5.2	......	2.5	......	2.9	3.6	......

NOTE.— Discharge relation affected by ice December 29 to March 31, inclusive.

Daily discharge, in second feet, of Hudson River at North Creek, N. Y., for the year ending September 30, 1914

DAY.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
1.....	385	1,390	600	480	832	600	2,910	8,330	450	3,290	642	1,000
2.....	485	1,390	560	480	832	685	3,290	7,220	450	5,200	642	832
3.....	685	832	600	480	814	685	3,290	3,480	450	2,360	642	685
4.....	780	520	642	480	780	732	2,910	3,290	385	1,120	642	560
5.....	732	450	685	480	780	732	2,720	4,740	560	1,460	600	450
6.....	685	418	600	480	732	732	2,100	4,520	485	3,100	600	450
7.....	600	418	600	480	780	780	1,680	5,930	520	2,100	600	450
8.....	560	361	780	480	780	780	1,840	4,740	520	642	780	450
9.....	520	1,250	832	480	732	732	3,680	2,540	450	600	885	450
10.....	520	6,430	1,120	470	640	780	3,680	4,520	520	520	780	780
11.....	520	5,440	885	460	640	780	3,480	2,910	385	520	780	885
12.....	520	4,740	732	450	600	732	3,100	2,540	361	1,250	780	832
13.....	520	2,720	780	442	642	732	2,720	1,460	337	1,460	780	832
14.....	520	2,010	685	450	685	732	2,180	885	314	942	780	885
15.....	485	1,680	685	560	732	780	2,720	1,390	261	780	780	885
16.....	450	1,390	685	642	687	780	2,720	1,250	560	685	780	885
17.....	450	1,120	600	642	685	780	3,290	942	560	685	780	832
18.....	450	942	600	600	732	780	3,880	1,600	325	780	780	832
19.....	418	780	485	560	732	780	7,490	832	261	885	780	780
20.....	560	1,120	485	600	885	780	17,300	780	35	885	885	780

Daily discharge, in second-feet, of Hudson River at North Creek, N. Y., for the year ending September 30, 1914 — continued

DAY.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
21.....	1,060	2,540	685	642	885	732	15,300	1,760	298	885	942	780
22.....	1,320	2,360	942	642	885	685	11,600	685	437	780	942	780
23.....	1,250	1,840	942	642	780	685	8,620	832	314	780	942	780
24.....	1,060	1,460	732	642	732	642	6,430	3,100	270	733	942	780
25.....	780	1,250	485	685	732	642	5,680	642	270	733	942	780
26.....	832	1,320	450	656	685	685	5,930	1,320	325	685	885	780
27.....	1,320	942	418	685	685	780	7,490	1,250	450	685	885	780
28.....	1,180	832	314	732	642	1,000	9,200	2,720	485	685	885	780
29.....	942	642	361	732	......	1,390	10,100	685	520	685	942	780
30.....	885	732	457	685	......	1,920	11,000	560	600	685	942	780
31.....	832	......	479	732	......	2,450	......	385	......	685	1,530	......

NOTE.— Daily discharge, estimated during the frozen period December 29 to March 31, is fairly good. Daily discharge for open water periods determined from a well-defined rating curve.

Monthly discharge of Hudson River at North Creek, N. Y., for the year ending September 30, 1914
[Drainage area, 804 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,320	385	720	0.896	1.03	A
November	6,430	361	1,640	2.04	2.28	A
December	1,120	314	642	.799	.92	B
January	732	442	570	.709	.82	B
February	885	600	741	.922	.96	B
March	2,450	600	855	1.06	1.22	B
April	17,300	1,680	5,610	6.98	7.79	A
May	8,330	385	2,510	3.12	3.60	A
June	600	261	413	.512	.57	B
July	5,200	520	1,200	1.49	1.72	A
August	1,530	600	822	1.02	1.18	A
September	1,000	450	744	.925	1.03	A
The year	17,300	261	1,370	1.70	23.12	......

NOTE.— No correction made for regulation at Indian lake. (See Indian lake records.)

HUDSON RIVER AT THURMAN, N. Y.

Location.— At the Delaware & Hudson Railroad bridge leading from Thurman to Warrensburg, about 950 feet below the highway bridge to Warrensburg, about 2,000 feet below the mouth of Schroon river, and about 13 miles above the mouth of Sacandaga river, which enters from the right.

Records available.— September 1, 1907, to September 30, 1914.

Drainage area.— 1,550 square miles.

Gage.— Chain; read twice daily; datum unchanged.

Control.— Sand and gravel; liable to shift.

Discharge measurements.— Made from the bridge.

Regulation.— The influence of storage at Indian lake and of mills on Schroon river is apparent at this station.

Winter flow.— Discharge relation affected by ice. Winter flow estimated from the determinations of combined flow at Riverbank and North Creek plus an estimated inflow between the two stations.

Accuracy.— Accuracy of the records somewhat impaired by reason of accumulations of logs at the control point below the section, and also around the piers of the bridge, which affect the discharge rating. Rating curve fairly well defined for normal conditions and determinations of flow during the open water season are considered fairly accurate.

Co-operation.— Gage heights from December to March, inclusive, furnished by Albany office of United States Weather Bureau. Gage heights from May to September, inclusive, furnished by the International Paper Co.

Discharge measurements of Hudson River at Thurman, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 3	G. H. Canfield	2.68	860
1914			
April 23	W. S. Easterly	7.85	17,300
May 6	C. S. De Golyer	5.86	9,380

Daily gage height, in feet, of Hudson River at Thurman, N. Y., for the year ending September 30, 1914

[S. H. Spencer, observer]

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	2.42	3.1	2.9	6.5	7.3	3.0	3.05	2.63	3.15
2	2.58	3.3	3.1	6.3	6.8	2.94	4.5	2.58	2.79
3	2.74	3.1	3.0	6.0	6.1	2.97	3.7	2.86	2.84
4	2.86	2.92	3.0	5.5	5.6	2.86	2.49	2.86	2.83
5	2.84	2.63	3.0	5.2	5.5	3.0	2.44	2.8	2.78
6	2.84	2.82	3.0	5.0	5.6	3.0	2.62	2.81	2.52
7	2.74	2.8	3.1	4.8	6.0	2.82	3.05	2.78	2.66
8	2.66	2.7	3.2	4.9	5.4	2.82	2.81	2.76	2.68
9	2.61	2.52	3.4	5.4	4.6	2.84	2.78	2.67	2.62
10	2.6	5.6	3.4	5.6	4.6	2.88	2.75	2.84	2.9
11	2.54	5.1	3.4	5.7	4.4	3.0	2.7	2.94	2.94
12	2.6	4.5	3.1	5.8	4.7	2.91	2.9	2.92	3.0
13	2.58	4.1	3.3	5.6	4.1	3.0	3.1	2.9	2.96
14	2.54	3.8	3.3	5.4	4.7	2.43	2.86	2.78	3.0
15	2.54	3.65	3.2	5.5	4.0	2.72	2.88	2.9	2.94
16	2.54	3.35	3.1	5.6	4.5	2.85	2.78	2.76	2.9
17	2.51	3.3	3.1	5.8	3.7	3.1	2.66	2.87	2.84
18	2.54	3.3	3.1	6.1	4.3	3.0	2.78	2.84	2.94
19	2.48	3.1	3.0	7.2	3.75	2.92	2.79	2.88	2.92
20	2.88	3.3	2.9	9.3	3.6	2.95	3.0	2.86	2.81
21	3.2	3.8	3.0	9.7	4.4	2.34	2.93	3.0	2.94
22	3.25	3.95	3.2	8.8	3.3	2.8	2.86	3.05	2.7
23	3.35	3.75	2.9	7.9	3.4	2.85	2.8	2.88	2.7
24	3.25	3.6	3.2	7.2	3.9	2.81	2.76	3.05	2.69
25	3.1	3.5	2.7	6.7	3.35	2.96	2.72	2.88	2.82
26	3.55	3.35	3.3	6.8	3.5	2.78	2.62	2.98	2.79
27	3.5	3.3	3.8	6.9	3.7	2.84	2.81	2.9	2.86
28	3.45	3.2	4.0	6.9	4.1	2.54	2.76	2.93	2.78
29	3.4	3.15	4.2	7.2	3.3	2.96	2.75	3.1	2.76
30	3.25	3.0	4.3	7.8	3.05	3.0	2.76	3.3	2.74
31	3.15	......	4.5	......	3.55	......	2.62	3.4	......

NOTE.— Mean daily gage heights for April are based on three or four observations per day Gage heights for the remainder of the year are means of two observations per day.

Daily discharge, in second-feet, of Hudson River at Thurman, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	562	1,550	1,200	11,700	14,900	1,370	1,460	809	1,640
2	746	1,940	1,550	11,000	12,900	1,270	5,000	746	1,030
3	956	1,550	1,370	9,860	10,200	1,320	2,840	1,140	1,100
4	1,140	1,230	1,370	8,100	8,440	1,140	639	1,140	1,090
5	1,100	809	1,370	7,100	8,100	1,370	584	1,040	1,010
6	1,100	1,070	1,370	6,470	8,440	1,370	796	1,060	674
7	956	1,040	1,550	5,870	9,860	1,070	1,460	1,010	848
8	848	900	1,740	6,170	7,760	1,070	1,060	984	874
9	783	674	2,150	7,760	5,290	1,100	1,010	861	796
10	770	8,440	2,150	8,440	5,290	1,170	970	1,100	1,200
11	698	6,780	2,150	8,790	4,710	1,370	900	1,270	1,270
12	770	5,000	1,550	9,140	5,580	1,220	1,200	1,230	1,370
13	746	3,860	1,940	8,440	3,860	1,370	1,550	1,200	1,300
14	698	3,080	1,940	7,760	5,580	573	1,140	1,010	1,370
15	698	2,720	1,740	8,100	3,590	928	1,170	1,200	1,270
16	698	2,040	1,550	8,440	5,000	1,120	1,010	984	1,200
17	662	1,940	1,550	9,140	2,840	1,550	848	1,150	1,100
18	698	1,940	1,550	10,200	4,420	1,370	1,010	1,100	1,270
19	628	1,550	1,370	14,500	2,960	1,230	1,030	1,170	1,230
20	1,170	1,940	1,200	24,100	2,600	1,280	1,370	1,140	1,060
21	1,740	3,080	1,370	26,100	4,710	480	1,250	1,370	1,270
22	1,840	3,460	1,740	21,600	1,940	1,040	1,140	1,460	900
23	2,040	2,960	1,200	17,500	2,150	1,120	1,040	1,170	900
24	1,840	2,600	1,740	14,500	3,330	1,060	984	1,460	887
25	1,550	2,370	900	12,500	2,040	1,300	928	1,170	1,070
26	2,480	2,040	970	12,900	2,370	1,010	796	1,340	1,030
27	2,370	1,940	910	13,300	2,840	1,100	1,060	1,200	1,140
28	2,260	1,740	770	13,300	3,860	698	984	1,250	1,010
29	2,150	1,640	830	14,500	1,940	1,300	970	1,550	984
30	1,840	1,370	930	17,000	1,460	1,370	984	1,940	956
31	1,640	......	930	......	2,480	......	796	2,150	......

NOTE.— Daily discharge determined from a well-defined rating curve.

Monthly discharge of Hudson River at Thurman, N. Y., for the year ending September 30, 1914

[Drainage area, 1,550 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	2,480	562	1,230	.794	.92	B
November	8,440	674	2,440	1.57	1.75	A
December	2,150	900	1,440	.929	1.07	B
January	....	....	994	.641	.74	C
February	....	....	1,130	.729	.76	C
March	....	....	1,350	.871	1.00	C
April	26,100	5,870	11,800	7.61	8.49	A
May	14,900	1,460	5,210	3.36	3.87	A
June	1,550	480	1,160	.748	.83	B
July	5,000	584	1,230	.794	.92	B
August	2,150	746	1,210	.781	.90	B
September	1,640	674	1,090	.703	.78	B
The year	26,100	480	2,520	1.63	22.03	......

NOTE.— Mean discharge for January, February and March, computed from the combined flow at North Creek and Riverbank plus an estimated inflow between these points and Thurman.

HUDSON RIVER AT SPIER FALLS, N. Y.

Location.— On the river road, one-half mile below the Spier Falls dam, about 11½ miles below the mouth of Sacandaga river. This station is most easily accessible from Glens Falls, N. Y.; distance 11 miles.

Records available.— October 7, 1912, to September 30, 1914.

Drainage area.— 2,800 square miles. (Measured on U. S. G. S. topographic sheets.)

Gage.— Recording hydrograph and auxiliary sloping staff gage. The automatic gage is in a brick shelter five feet square inside dimensions. Underneath the shelter is a brick well 3½ feet square and 21 feet deep. This well is connected with the river by a 4-inch cast iron water pipe 78 feet long. A shear gate valve is set at the inner end of the pipe for use in cleaning the well when necessary. The outer end is fastened firmly in a concrete anchorage and is submerged at all stages. Inside the well is a hook gage used for setting the automatic gage. The sloping staff gage is mounted on small concrete piers 10 feet upstream from the shelter.

Control.—Coarse gravel and boulders.

Discharge measurements.— Made from a cable and car, located about 1,000 feet downstream from the automatic gage.

Winter flow.— Backwater from ice prevails only during extreme cold weather.

Regulation.— There is a large diurnal fluctuation in flow due to the operation of Spier Falls power plant.

Accuracy.— Rating curve well defined. Estimates as published are excellent.

Co-operation.— The gage is operated by Mr. Geo. C. Fifield, chief operator at the power plant.

Discharge measurements of Hudson River at Spier Falls, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Mar. 12	W. S. Easterly	3.34	2,350
April 21	O. W. Hartwell	15.12	51,900
24	C. S. De Golyer	a11.75	32,600
24	W. S. Easterly	a11.65	32,000
June 9	C. H. Pierce	3.50	2,720

a Staff gage reading.

Daily discharge, in second-feet, of Hudson River at Spier Falls, N. Y., for year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	792	3,350	3,210	1,860	1,940	943	14,000	29,900	2,620	1,260	1,130	3,670
2	755	2,860	2,610	1,860	2,480	2,180	16,900	26,700	2,450	4,710	1,000	2,740
3	957	3,220	2,800	1,500	2,190	1,490	18,200	......	2,210	3,420	1,230	2,400
4	1,260	2,420	2,570	698	2,180	1,830	18,500	17,500	2,150	1,940	1,330	2,340
5	906	2,510	[illegible],680	1,710	2,120	1,290	18,200	16,100	2,300	1,370	1,280	2,140
6	1,760	2,4[illegible]	2,940	1,930	2,460	1,590	15,100	17,300	1,880	1,720	1,200	1,560
7	1,380	2,070	2,550	1,740	1,890	1,670	12,900	15,800	1,660	1,640	1,260	1,430
8	1,160	1,750	5,100	1,730	1,770	1,280	13,500	15,000	2,270	1,850	1,190	2,280
9	1,320	1,560	5,670	1,470	2,560	2,000	21,900	12,000	2,010	1,960	1,100	2,060
10	1,230	13,300	5,080	1,830	2,280	1,790	23,100	10,600	2,060	1,980	1,430	1,930

Daily discharge in second-feet of Hudson River at Spier Falls, N. Y., for year ending September 30, 1914 — continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
11......	1,050	16,000	4,890	1,270	1,800	1,510	22,700	9,480	1,550	1,720	1,730	1,500
12......	442	13,700	3,380	1,670	1,070	1,630	21,700	8,270	1,980	1,420	1,380	1,410
13......	1,230	11,100	3,250	1,610	1,430	1,520	20,100	9,050	1,950	2,170	1,440	1,300
14......	1,230	8,780	3,690	1,250	1,840	2,030	18,000	9,300	1,390	2,420	1,420	2,240
15......	1,240	7,070	3,650	1,010	1,340	1,350	17,800	9,130	1,840	2,060	1,140	1,660
16......	1,240	5,610	3,260	1,290	1,320	1,520	18,500	8,080	1,720	1,760	615	1,520
17......	1,190	......	3,160	1,220	1,390	1,710	17,600	7,600	1,270	1,920	1,430	1,500
18......	1,240	......	3,160	1,510	1,480	2,030	20,600	6,320	1,570	1,640	1,430	1,560
19......	401	3,360	2,990	1,800	1,420	2,600	26,000	6,150	1,800	1,320	1,300	1,600
20......	1,550	3,450	2,510	1,460	1,570	2,130	38,500	4,850	1,460	1,930	1,250	1,250
21......	2,180	4,820	1,600	1,540	1,310	2,060	50,100	4,510	1,280	1,930	1,810	1,520
22......	3,300	6,080	2,690	1,420	1,620	1,250	47,700	4,700	1,190	1,480	1,740	1,550
23......	3,580	5,440	2,810	1,420	1,210	2,560	41,300	3,480	950	1,300	1,120	1,560
24......	3,210	5,050	......	1,580	1,350	2,110	34,200	3,680	1,050	1,400	2,220	1,580
25......	3,000	4,230	......	1,860	1,470	1,760	27,900	4,260	982	1,230	1,990	1,480
26......	4,080	3,820	......	1,840	1,380	1,770	26,900	3,070	1,090	1,340	1,510	1,750
27......	5,370	3,540	2,080	2,030	1,350	2,570	26,500	3,770	1,430	1,560	1,380	1,140
28......	5,200	3,220	830	1,840	1,720	5,820	26,300	3,600	756	1,300	2,010	1,730
29......	4,580	3,040	1,860	1,970	......	9,000	26,800	3,880	951	1,330	1,650	1,350
30......	4,070	2,220	1,620	1,740	......	10,500	30,400	2,800	1,640	1,310	3,710	1,290
31......	3,600	......	2,650	1,640	......	11,800	......	2,670	......	1,280	4,190	......

NOTE.— Discharge relation affected by ice from February 13 to March 9, inclusive. Daily discharge during this period computed from records at the Spier Falls power plant. Discharges for the remainder of the year are the mean of 24 hourly values for each day. Discharge determined from a well-defined rating curve.

Monthly discharge of Hudson River at Spier Falls, N. Y., for the year ending September 30, 1914

[Drainage area, 2,800 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	5,370	*a*401	2,080	.743	.86	A
November....................	16,000	*a*1,560	5,150	1.84	2.05	A
December....................	5,670	*a*831	2,990	1.07	1.23	A
January....................	2,030	*a*698	1,590	.568	.65	A
February....................	2,560	1,070	1,710	.611	.64	B
March....................	11,800	*a*943	2,750	.982	1.13	A
April....................	50,100	12,900	24,400	8.71	9.72	A
May....................	29,900	*a*2,670	9,660	3.45	3.98	A
June....................	2,620	*a*756	1,650	.589	.66	A
July....................	4,710	1,230	1,800	.643	.74	A
August....................	4,190	*a*615	1,570	.561	.65	A
September....................	3,670	*a*1,140	1,770	.632	.71	A
The year..............	50,100	*a*401	4,750	1.70	23.02	.....

a Sunday.
NOTE.— No correction made in the above table for seasonal regulation of flow.

HUDSON RIVER AT MECHANICVILLE, N. Y.

Location.—At the Duncan dam of the West Virginia Pulp & Paper Co., in the village of Mechanicville, about 3,700 feet above the mouth of Anthony-kill (coming in from the right), 1¼ miles below the mouth of Hoosic river (coming in from the left), and about 19 miles above the mouth of Mohawk river, which enters from the right at Cohoes.

Records available.— 1888 to September 30, 1914.

Drainage area.— 4,500 square miles.

Gage.—Recording gage installed at the dam in the summer of 1910 for the purpose of obtaining a more accurate register of the daily flow over the crest of the dam; previous to 1910 two gage readings daily on the crest of the dam.

Discharge measurements.— Determinations of discharge for periods previous to the summer of 1910 computed by using two daily gage readings on the crest of the dam and continuous record of the run of the wheels in the adjoining paper mill. In 1904 the dam was raised and a concrete crest and apron were added, so that it now has a rounded or ogee section. A discharge curve has been calculated by means of coefficients derived from the United States Geological Survey experiments on dams of ogee section.

Accuracy.— Records at this section are very carefully made and may be considered good for this type of station.

Co-operation.— Records are computed and furnished by Mr. R. P. Bloss, engineer of the West Virginia Pulp & Paper Co.

Daily discharge, in second-feet, of Hudson River at Mechanicville, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	1,143	5,005	5,607	3,632	8,183	881	27,337	30,433	5,342	1,209	1,141	4,925
2.....	1,511	2,470	4,101	3,631	5,845	1,684	37,606	35,674	3,696	1,502	584	4,287
3.....	1,259	5,138	4,254	2,590	5,046	4,032	30,541	27,746	3,624	5,506	1,930	3,220
4.....	998	4,487	3,968	859	5,220	4,413	26,330	23,920	4,155	3,500	1,179	2,725
5.....	750	3,224	4,564	1,945	5,847	4,129	28,308	19,824	2,877	3,395	1,175	3,171
6.....	1,442	3,559	4,568	1,823	4,551	4,126	23,501	23,346	3,836	1,958	1,217	1,800
7.....	1,438	3,693	1,479	1,887	4,566	3,844	20,712	21,359	2,778	3,342	1,053	2,607
8.....	1,820	3,279	8,240	2,161	3,246	1,066	30,356	18,598	3,339	1,665	963	1,706
9.....	1,174	1,433	7,194	2,115	3,746	3,981	42,298	18,233	3,587	2,558	462	2,825
10.....	1,192	10,169	7,534	2,399	4,033	3,986	35,189	14,315	2,284	2,177	1,322	1,559
11.....	1,043	19,215	7,200	920	4,006	4,146	30,042	14,072	2,822	2,417	883	2,825
12.....	980	16,085	6,431	3,249	3,211	2,572	31,924	12,492	2,430	2,415	1,757	1,557
13.....	1,689	13,419	4,655	2,243	2,116	2,742	28,511	15,545	2,588	2,474	1,039	546
14.....	1,257	11,964	4,706	2,203	2,192	4,036	25,611	12,983	1,016	2,862	1,050	1,712
15.....	1,271	9,445	7,358	2,169	876	849	24,362	13,381	2,225	2,860	1,057	2,766
16.....	1,296	3,106	5,544	1,875	1,767	4,359	22,612	10,654	2,457	2,482	938	1,846
17.....	1,315	7,871	4,778	1,718	1,769	11,040	25,045	7,425	2,459	1,591	1,027	1,656
18.....	1,283	6,617	5,517	927	1,767	8,683	26,922	9,023	1,905	1,938	930	1,053
19.....	560	5,847	5,614	1,235	1,755	7,125	29,690	7,741	1,165	1,144	2,104	1,054
20.....	1,647	4,896	4,429	1,472	1,861	5,837	52,639	6,901	2,684	1,788	1,226	1,097
21.....	1,469	5,768	4,261	1,631	1,861	4,928	57,498	6,071	968	2,410	1,265	1,587
22.....	2,140	1,195	5,143	1,488	865	3,505	64,788	6,160	1,644	2,407	2,475	1,416
23.....	4,447	4,434	3,862	1,562	2,041	3,687	50,945	5,701	1,588	2,015	950	1,094
24.....	3,756	7,470	4,805	1,655	2,003	5,256	41,109	4,131	1,471	1,461	1,290	1,106
25.....	3,783	6,034	4,152	940	2,087	6,120	35,016	6,009	1,328	1,323	2,203	1,143
26.....	4,309	5,404	3,960	2,785	1,818	12,371	32,000	4,774	1,199	949	2,563	970
27.....	10,553	5,263	4,460	3,003	1,822	21,685	32,424	4,998	970	1,205	1,804	900
28.....	9,203	5,147	2,005	3,142	1,773	27,672	30,052	5,006	404	1,972	1,059	1,166
29.....	7,024	3,241	3,025	3,659	......	22,200	31,626	4,973	1,888	1,264	2,576	2,203
30.....	6,738	3,463	4,349	5,827	......	21,607	35,824	4,924	1,043	1,247	952	1,376
31.....	5,753	......	2,364	5,798	......	19,804	......	4,042	......	1,277	4,898	......

Flash boards on dam from Dec. 1, 1913, to March 2, 1914, inclusive.
Flash boards partially gone from March 3, to April 3, inclusive. Flow not accurate.
Discharge August 23, estimated.

Monthly discharge of Hudson River at Mechanicville, N. Y., for the year ending September 30, 1914

[Drainage area, 4,500 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	10,553	[a]560	2,720	.604	.70
November	19,215	1,195	6,280	1.40	1.56
December	8,240	[a]1,479	4,840	1.08	1.24
January	5,827	[a]859	2,310	.513	.59
February	8,183	[a]865	3,070	.682	.71
March	27,672	[a]849	7,500	1.67	1.92
April	64,788	20,712	33,700	7.49	8.36
May	35,674	[a]4,042	12,900	2.87	3.31
June	5,342	[a]404	2,330	.518	.58
July	5,506	[a]949	2,140	.476	.55
August	4,898	[a]462	1,450	.322	.37
September	4,925	[a]546	1,930	.429	.48
The year	64,788	[a]404	6,750	1.50	20.37

[a] Sunday.

CEDAR RIVER NEAR INDIAN LAKE, N. Y.

Location.— At the steel highway bridge about 2 miles west of Indian Lake village, on the road leading to Blue Mountain lake, about 12 miles by river above its confluence with the Hudson, 8 miles by river above the mouth of Rock river and 10 miles by river below Cedar river flow (Wakely dam).

Records available.— July 15, 1911, to September 30, 1914.

Drainage area.— 85 square miles. (Measured on U. S. G. S. topographic sheets.)

Gage.— Standard chain and weight. Read once daily.

Control.— Gravel rift about 200 feet below the bridge; fairly permanent.

Discharge measurements.— Made from the bridge at high stages and by wading at low stages.

Storage.— The basin contains many lakes and swamps affording favorable sites for storage reservoirs which would be influential in regulating the discharge of Hudson river. The most important are Cedar lakes and Cedar river flow. Cedar river flow is controlled by a lumberman's dam and is used principally during the logging season.

Winter flow.— Discharge relation affected by ice during long winter period and observations suspended.

Accuracy.— Rating curve fairly well defined. Extreme fluctuations in stage during logging operations make daily discharge values very uncertain. Monthly estimates for these periods probably fair.

Discharge measurements of Cedar River near Indian Lake, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
April 30	C. S. De Golyer	10.41	2,910
May 1	do	4.72	401
2	do	9.76	2,420

Daily gage height, in feet, of Cedar River near Indian Lake, N.Y., for the year ending September 30, 1914
[Chauncey Hill, observer]

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	2.6	6.9	3.5	......	5.6	3.2	10.9	2.6	3.7
2	2.7	5.3	3.3	......	10.0	3.1	3.2	2.6	3.8
3	3.4	3.8	3.6	......	6.0	2.8	2.8	2.6	3.6
4	3.2	3.35	3.5	......	6.0	3.05	2.8	2.6	3.2
5	2.8	3.4	3.4	......	10.0	3.15	2.7	2.6	3.2
6	2.75	3.3	3.4	......	7.0	3.0	2.6	2.6	3.4
7	2.7	3.3	3.4	......	......	2.8	2.9	2.6	3.6
8	2.7	3.4	3.6	......	......	2.9	2.95	2.6	3.25
9	2.75	5.7	5.6	......	......	3.0	2.8	2.6	3.2
10	2.8	8.7	5.6	......	......	2.8	2.7	2.8	3.15
11	2.6	8.5	6.1	......	......	2.8	3.0	2.9	3.1
12	2.8	8.0	6.5	......	3.5	2.7	4.8	2.7	3.1
13	2.85	7.0	6.4	......	4.1	2.75	4.0	2.6	3.05
14	2.8	4.0	6.3	......	3.8	2.65	4.1	2.6	3.0
15	2.8	3.9	5.5	......	3.7	2.7	4.0	2.6	3.0
16	2.7	3.7	5.5	5.8	3.7	2.7	3.7	2.6	3.0
17	2.7	3.5	5.4	4.8	3.6	2.65	3.65	2.6	2.9
18	2.75	3.45	5.4	4.6	4.0	2.6	3.4	2.6	2.7
19	2.7	3.5	5.0	6.1	3.6	2.6	3.0	4.2	2.6
20	3.6	5.3	5.1	12.0	3.2	2.8	2.9	4.3	2.6
21	5.9	4.8	......	10.0	3.2	2.7	3.0	5.0	2.55
22	4.5	4.3	......	6.0	3.15	2.6	2.9	5.2	2.5
23	4.0	4.4	......	3.95	5.9	2.6	2.7	4.8	2.55
24	3.95	4.5	......	4.0	4.1	2.6	2.8	5.3	2.8
25	4.0	5.5	......	8.0	5.6	2.55	2.6	3.2	2.9
26	4.2	3.6	......	3.0	5.5	2.6	2.7	3.0	2.7
27	4.2	3.4	......	3.0	4.3	2.6	2.65	3.05	2.8
28	4.4	3.35	......	10.0	3.15	2.8	2.6	4.0	2.7
29	4.0	3.4	......	6.6	2.8	3.4	2.6	5.0	2.7
30	4.3	3.3	......	10.0	9.5	3.0	2.65	5.0	2.8
31	4.4	......	......	......	8.2	......	2.7	4.0	......

NOTE.— Discharge relation affected by ice December 9 to April 15, inclusive.

Daily discharge, in second-feet, of Cedar River near Indian Lake, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	26	1,170	128	......	668	84	3,050	26	164
2	33	570	98	......	2,600	72	84	26	184
3	112	184	146	......	810	41	41	26	146
4	84	105	128	......	810	66	41	26	84
5	41	112	112	......	2,600	78	33	26	84
6	37	98	112	......	1,210	61	26	26	112
7	33	98	112	......	......	41	51	26	146
8	33	112	146	......	......	51	56	26	91
9	37	702	......	......	......	61	41	26	84
10	41	1,970	......	......	......	41	33	41	78
11	26	1,870	......	......	......	41	61	51	72
12	41	1,640	......	......	128	33	296	33	72
13	46	1,210	......	......	248	37	226	26	66
14	41	226	......	......	184	30	248	26	61
15	41	204	......	......	164	33	226	26	61
16	33	164	......	738	164	33	164	26	61
17	33	128	......	422	146	30	155	26	51
18	37	120	......	370	226	26	112	26	33
19	33	128	......	848	146	26	61	272	26
20	146	570	......	3,600	84	41	51	296	26
21	774	422	......	2,600	84	33	61	478	23
22	344	296	......	810	78	26	51	538	20
23	226	320	......	215	774	26	33	422	23
24	215	344	......	226	248	26	41	570	41
25	226	634	......	1,640	668	23	26	84	51
26	272	146	......	61	634	26	33	61	33
27	272	112	......	61	296	26	30	66	41
28	320	105	......	2,600	78	41	26	226	33
29	226	112	......	1,040	41	112	26	478	33
30	296	98	......	2,600	2,350	61	30	478	41
31	320	......	......	......	1,730	......	33	226	......

NOTE.— Daily discharge determined from a fairly well-defined rating curve. See "Accuracy" n station description.

Monthly discharge of Cedar River near Indian Lake, N. Y., for the year ending September 30, 1914

[Drainage area, 85 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	774	26	143	1.68	1.94	B
November	1,970	98	466	5.48	6.11	B
December 1–8	146	98	123	1.45	.43	......
April 16–30	3,600	61	1,190	14.0	7.81	D
May	2,600	41	620	7.29	8.40	C
June	112	23	44.2	.520	.58	B
July	3,050	26	176	2.07	2.39	D
August	570	26	152	1.79	2.06	C
September	184	20	68.3	.804	.90	C

NOTE.— Mean discharge May 7 to 11, inclusive, estimated 410 second-feet.

INDIAN LAKE RESERVOIR AT INDIAN LAKE, N. Y.

Location.— At the masonry storage dam at the outlet of Indian lake, about 7½ miles above the confluence of Indian river with the Hudson and about 23½ miles above the village of North Creek.

Records available.— July 22, 1900, to September 30, 1914.

Drainage area.— 131 square miles, including about 9.3 square miles of water surface of Indian lake at the elevation of crest of spillway.

Gages.— Elevation of water surface in the reservoir is determined by a chain gage on the crest of dam in the angle by the gate house read once a day. This gage was installed November 17, 1911, to replace a staff gage previously maintained at same point; datum unchanged. Widths of sluice gate openings determined by gage scales at sides of gate stems inside gate house. Current meter measurements are referred to a vertical staff gage, in three sections, on right bank of stream about three-fourths mile below the dam.

Discharge measurements.— Current meter measurements made at the cable station about three-fourths mile below the dam.

Discharge ratings.— The records include the discharge through one or both of two 5-foot circular sluice gates when open, ratings for which have been determined by current meter measurements; the discharge over a spillway, consisting of five sections with a total effective length of 88.7 feet, the rating for which has been prepared by the use of coefficients derived from experiments made in the hydraulic laboratory of Cornell University on a full-size model 6.58 feet in length;[1] and the discharge through two log ways when open.

Regulation.—At ordinary stages the discharge is completely regulated by the operation of the sluice gates. Water is held in storage until needed to supplement the flow of the upper Hudson river during the low water period. The storage capacity of about 4.7 billion cubic feet provides for a discharge of approximately 600 second-feet for a period of 90 days.

Accuracy.— Occasional errors in records of sluice gate openings, especially for days when gates are changed, cause corresponding inaccuracy in estimates of discharge. A comparative study of discharge as determined by current meter rating and observed gage heights at the cable station and the discharge as determined by the sluice gate ratings from July 1, 1913, to April 30, 1914, shows a maximum difference in the monthly mean discharge, as determined by the different ratings, of 7.6 per cent; the average difference for the 10 months' period was 1.1 per cent.

Maximum and minimum gage heights.— The maximum height of water in the reservoir since its construction was 38.8 feet gage height on March 28, 1913; the minimum stage, 2 feet gage height, was recorded on March 9 to 18, 1907, and January 3 to 17, 1910.

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[1] See Water Supply Paper 200, pages 190–192.

Monthly discharge of Indian Lake reservoir at Indian Lake, N. Y., for 1900–1914

[Drainage area, 131 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	RAINFALL	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	Inches *d*	
1900							
July 22–31	1,290	344	985	0.75	0.28	4.45	B
August	656	*c* 0	355	2.71	3.12	4.27	B
September	781	395	642	4.90	5.47	1.89	B
1900–1901							
October	628	430	525	4.01	4.62	2.31	B
November	424	*c* 0	282	2.15	2.40	7.16	B
December	*b* 0	*b* 0	*b* 0	00	00	4.37	
January	379	*c* 0	219	1.67	1.92	2.31	B
February	373	185	288	2.20	2.29	.51	B
March	166	*c* 0	42.8	.33	.38	2.95	C
April	*b* 0	*b* 0	*b* 0	00	00	1.88	
May *a*	463	*c* 0	76.5	.58	.67	4.34	D
June *a*	802	*c* ..0	296	2.26	2.52	3.83	D
July *a*	839	41	300	2.29	2.64	4.65	D
August	568	*c*	237	1.81	2.09	5.62	B
September	917	*c*	506	3.86	4.31	4.59	B
The year	839	*c*	230	1.76	23.84	44.52	
1901–1902							
October	858	*c* 0	350	2.67	3.08	2.99	B
November	812	*c* 0	524	4.00	4.46	1.21	B
December	652	*c* 0	218	1.66	1.91	3.11	C
January	285	*c* 0	182	1.39	1.60	2.01	B
February	670	256	427	3.26	3.40	2.38	B
March	*b* 0	*b* 0	*b* 0	00	00	1.65	
April	598	*c* 0	147	1.12	1.25	5.68	D
May *a*	1,440	*c* 0	465	3.55	4.09	4.06	D
June *a*	423	151	244	1.86	2.08	5.63	D
July *a*	915	111	460	3.51	4.05	8.31	D
August *a*	599	132	340	2.60	3.00	4.14	C
September	680	*c* 0	354	2.70	3.01	3.28	B
The year	1,440	*c* 0	308	2.35	31.93	44.45	
1902–1903							
October	975	*c* 0	303	2.31	2.66	5.42	C
November	919	*c* 0	517	3.95	4.41	1.77	B
December	553	*c* 0	302	2.31	2.66	3.55	C
January	459	373	400	3.05	3.52	3.38	B
February	373	354	366	2.79	2.90	4.04	B
March	1,060	25	418	3.19	3.68	4.83	B
April *a*	1,560	110	875	6.68	7.45	2.16	B
May *a*	1,710	*c* 0	188	1.44	1.66	.21	C
June	788	*c* 0	292	2.23	2.49	6.47	C
July	943	*c* 0	273	2.08	2.40	4.68	C
August	718	*c* 0	124	.95	1.10	4.83	D
September	433	*c* 0	268	2.05	2.29	1.36	C
The year	1,710	*c* 0	361	2.76	37.22	42.70	
1903–1904							
October	729	*c*	391	2.98	3.44	5.92	B
November	981	197	368	2.81	3.14	1.33	B
December	862	362	671	5.12	5.90	4.15	B
January	509	337	417	3.18	3.67	3.41	B
February	423	230	316	2.41	2.60	2.23	B
March	231	*c* 0	167	1.27	1.46	3.45	B
April	*b* 0	*b* 0	*b* 0	00	00	2.44	
May *a*	603	*c* 0	230	1,76	2.03	2.60	C
June *a*	605	*b* 0	55.4	.42	.47	2.97	D
July *a*	721	*c* 0	333	2.54	2.93	3.25	C
August	628	*c* 0	328	2.50	2.88	4.08	C
September	846	*c* 0	685	5.23	5.84	5.10	B
The Year	981	*c* 0	332	2.53	34.36	40.93	

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a The surface of the reservoir was above the crest of the spillway during the whole or a part of this month. The discharge is computed by using various heights of flash boards which were assumed from a hydrograph study of the lake elevations and records from stations downstream.

b Records show that gates were closed throughout the month; some leakage around the gates and also run-off below the dam but above the cable station give a small discharge at that point.

c Gates closed for one or more days during the month; some discharge at cable station.

d At United States weather bureau station at Indian Lake, N. Y.

Monthly discharge of Indian Lake reservoir at Indian Lake, N. Y., for 1900-1914 — Continued

[Drainage area, 131 square miles.]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	RAINFALL	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	Inches *d*	
1904-1905							
October	259	*c* 0	8.4	.06	.07	4.25	B
November	596	*c* 0	129	.98	1.09	.45	C
December	773	408	652	4.98	5.74	1.78	B
January	569	296	365	2.79	3.22	1.92	B
February	545	400	472	3.60	3.75	1.52	B
March	394	*c* 0	235	1.79	2.06	2.20	C
April	*b* 0	*b* 0	*b* 0	00	00	3.13	
May	*b* 0	*b* 0	*b* 0	00	00	1.80	
June *a*	442	*c* 0	62.6	.48	.54	9.00	D
July *a*	847	*c* 0	292	2.23	2.57	4.80	C
August *a*	581	*c* 0	186	1.42	1.64	2.40	C
September *a*	751	190	458	3.50	3.90	6.20	C
The year	847	*c* 0	237	1.81	24.58	39.45	
1905-1906							
October *a*	1,060	*c* 0	310	2.37	2.73	2.85	D
November	1,030	93	343	2.62	2.92	1.47	C
December	565	94	156	1.19	1.37	2.81	C
January	639	101	452	3.45	3.98	1.91	B
February	949	542	712	5.44	5.66	1.32	C
March	825	621	720	5.49	6.33	3.12	B
April	616	*c* 0	71	.54	.60	1.70	C
May	466	*c* 0	231	1.76	2.03	4.88	D
June	776	*c* 0	118	.90	1.00	4.80	D
July *a*	415	51	187	1.43	1.65	2.90	C
August	915	177	432	3.30	3.80	3.63	C
September	896	580	724	5.53	6.17	3.15	B
The year	1,060	*c* 0	369	2.82	38.24	34.54	
1906-1907							
October	647	474	551	4.20	4.84	3.57	B
November	467	242	395	3.02	3.37	3.05	B
December	398	*c* 0	229	1.75	2.02	2.40	B
January	398	*c* 0	98.6	.75	.86	4.60	C
February	482	241	385	2.94	3.06	.93	B
March	260	*c* 0	104	.79	.91	1.54	D
April	*b* 0	*b* 0	*b* 0	00	00	3.95	
May	330	*c* 0	27.4	.21	.24	3.35	D
June	*b* 0	*b* 0	*b* 0	00	00	2.80	
July	566	*c* 0	172	1.31	1.51	2.25	D
August	903	478	653	4.98	5.74	1.45	C
September	779	*c* 0	273	2.08	2.32	7.33	C
The year	903	*c* 0	240	1.83	24.87	37.22	
1907-1908							
October	193	*c* 0	9.3	.07	.08	4.66	D
November	*b* 0	*b* 0	*b* 0	00	00	5.90	
December *a*	688	*c* 0	278	2.12	2.44	5.34	D
January *a*	637	231	345	2.63	3.03	2.68	D
February *a*	756	*c* 0	403	3.08	3.32	5.65	C
March *a*	1,050	*c* 0	769	5.87	6.77	1.97	C
April	3,120	*c* 0	669	5.11	5.70	3.55	D
May	2,960	120	1,100	8.40	9.68	6.10	D
June	324	16	127	.97	1.08	1.15	C
July	570	*c* 0	441	3.37	3.88	3.05	C
August	520	456	488	3.73	4.30	1.70	B
September	454	384	417	3.18	3.55	1.45	B
The year	3,120	*c* 0	423	3.23	43.83	43.20	

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a The surface of the reservoir was above the crest of the spillway during the whole or a part of this month. The discharge is computed by using various heights of flash boards which were assumed from a hydrograph study of the lake elevations and records from stations downstream.

b Records show that gates were closed throughout the month; some leakage around the gates and also run-off below the dam but above the cable station give a small discharge at that point.

c Gates closed for one or more days during the month; some discharge at cable station.

d At United States weather bureau station at Indian Lake, N. Y.

Monthly discharge of Indian Lake reservoir at Indian Lake, N. Y., for 1900–1914 — Continued
[Drainage area, 131 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	RAINFALL	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	Inches d	
1908–1909							
October	380	307	344	2.63	3.03	2.15	B
November	304	259	278	2.12	2.36	2.13	B
December	259	202	230	1.76	2.03	3.14	B
January	250	c 0	58.8	.45	.52	3.50	D
February	b 0	b 0	b 0	00	00	6.15	
March	433	c 0	111	.85	.98	2.55	D
April	965	c 0	64.9	.50	.56	2.15	D
May	1,920	256	944	7.21	8.31	2.87	D
June	334	127	264	2.01	2.24	2.20	D
July	572	58	340	2.60	3.00	2.35	C
August	834	c 0	574	4.38	5.05	2.15	C
September	602	404	498	3.81	4.25	2.00	C
The year	1,920	c 0	312	2.39	32.33	33.34	
1909–1910							
October	533	365	442	3.37	3.88	1.80	B
November	384	253	304	2.32	2.59	2.60	C
December	260	179	230	1.76	2.03	1.72	C
January	251	c 0	140	1.07	1.23	2.74	C
February	367	c 0	206	1.57	1.64	5.37	C
March	171	c 0	5.5	.04	.05	2.20	D
April	b 0	b 0	b 0	00	00	2.65	
May a	215	c 0	48.9	.37	.43	5.01	D
June a	648	215	384	2.93	3.27	3.30	D
July	383	114	279	2.13	2.46	2.90	C
August	630	c 0	320	2.44	2.81	5.64	B
September	600	c 0	375	2.86	3.19	4.66	B
The year	776	c 0	228	1.79	23.58	40.59	
1910–1911							
October	690	0	485	3.70	4.27	2.00	B
November	605	0	191	1.46	1.63	e3.17	C
December	572	203	401	3.06	3.53	2.90	C
January	358	0	146	1.11	1.28	1.22	D
February	346	290	319	2.44	2.54	2.50	C
March	380	c 0	274	2.09	2.41	2.91	C
April	b 0	b 0	b 0	00	00	1.12	
May	b 0	b 0	b 0	00	00	2.57	
June	b 0	b 0	b 0	00	00	3.89	
July	802	c 0	553	4.22	4.86	1.15	C
August	725	342	611	4.66	5.37	2.56	B
September	395	c 0	190	1.45	1.62	2.70	C
The year	802	c 0	266	2.03	27.51	28.69	
1911–1912							
October	376	c 0	42.3	.32	.37	3.35	D
November	b 0	b 0	b 0	00	00	4.40	
December	b 0	b 0	b 0	00	00	3.95	
January	658	c 0	304	2.32	2.68	1.91	C
February	787	644	743	5.67	6.12	2.32	B
March	638	c 0	330	2.52	2.90	2.15	C
April	301	c 0	17.7	.14	.16	3.20	D
May	1,080	398	723	5.52	6.36	4.40	C
June	618	88	297	2.27	2.53	.42	C
July	906	347	505	3.86	4.45	1.95	B
August	775	511	686	5.24	6.04	3.88	B
September	607	c 0	334	2.55	2.84	4.60	B
The year	1,080	c 0	330	2.52	34.45	36.53	

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a The surface of the reservoir was above the crest of the spillway during the whole or a part of this month. The discharge is computed by using various heights of flash boards which were assumed from a hydrograph study of the lake elevations and records from stations downstream.

b Records show that gates were closed throughout the month; some leakage around the gates and also run-off below the dam but above the cable station give a small discharge at that point.

c Gates closed for one or more days during the month; some discharge at cable station.

d At United States weather bureau station at Indian Lake, N. Y.

e Estimated.

Monthly discharge of Indian Lake reservoir at Indian Lake, N. Y., for 1900–1914 — Continued

[Drainage area, 131 square miles]

MONTH	Discharge in Second-feet				Run-off	Rainfall	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	Inches [d]	
1912–1913							
October	391	[c] 0	100	.76	.88	2.85	C
November	[b] 0	[b] 0	[b] 0	00	00	4.60	
December	[b] 0	[b] 0	[b] 0	00	00	[e]2.00	
January	954	[c] 0	230	1.76	2.03	4.79	C
February	734	301	500	3.82	3.98	1.69	D
March	4,730	[c] 0	1,030	7.86	9.06	8.32	D
April	1,870	348	878	6.70	7.48	3.23	C
May	618	60	194	1.48	1.71	3.05	C
June	560	104	323	2.46	2.74	.48	B
July	852	336	500	3.82	4.40	3.03	A
August	492	424	469	3.58	4.13	1.18	A
September	421	[c] 0	351	2.68	2.99	2.77	A
The year	4,730	[c] 0	384	2.93	39.40	37.99	
1913–1914							
October	360	[c] 0	212	1.62	1.87	6.28	B
November	[b] 0	[b] 0	[b] 0	00	0	3.90	
December	452	[c] 0	43.5	.33	.38	2.30	B
January	454	[c] 0	396	3.03	3.49	3.64	A
February	515	374	417	3.19	3.32	1.90	A
March	334	[c] 0	257	1.96	2.26	2.33	A
April	[b] 0	[b] 0	[b] 0	00	00	5.51	
May	680	[c] 0	129	.98	1.13	1.43	D
June	406	16	123	.94	1.05	2.83	D
July	650	[c] 0	302	2.30	2.65	3.74	C
August	730	321	645	4.92	5.67	4.82	B
September	705	[c] 0	462	3.55	3.96	2.11	C
The year	730	[c] 0	248	1.89	25.78	40.79	

[a] The surface of the reservoir was above the crest of the spillway during the whole or a part of this month. The discharge is computed by using various heights of flash boards which were assumed from a hydrograph study of the lake elevations and records from stations downstream.

[b] Records show that gates were closed throughout the month; some leakage around the gates and also run-off below the dam but above the cable station give a small discharge at that point.

[c] Gates closed for one or more days during the month; some discharge at cable station.

[d] At United States weather bureau station at Indian Lake, N. Y.

[e] Estimated.

INDIAN RIVER NEAR INDIAN LAKE, N. Y.

Location.— About three-fourths of a mile below State dam, at the outlet of Indian lake, 1 mile above the mouth of Big brook and 8 miles above the point where it enters the Hudson. Big brook is the only important tributary of Indian river below this station.

Records available.— Miscellaneous measurements, 1911; July 1, 1912, to June 30, 1914.

Drainage area.— 132 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Vertical staff, nailed to stump.

Channel.— Pond of still water at head of rocky rapids.

Regulation.— The flow of Indian river is controlled by the operation of the gates at the Indian Lake dam.

Discharge measurements.— Made from a cable about 75 feet below the gage or by wading at head of rapids about 150 feet below.

Winter flow.— Gage heights not seriously affected by ice.

Accuracy.— Discharge rating curve well defined. Conditions for meter measurements fairly good.

Discharge measurements of Indian River near Indian Lake, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
April 30	C. S. De Golyer	2.50	416
May 1 *a*	do	.46	14.8
1	do	3.86	957

a Measurement made by wading at cable section.

Daily gage height, in feet, of Indian River near Indian Lake, N. Y., for the year ending September 30, 1914

[Lester Sevarie, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	2.3	.1	.1	.05	2.4	2.35	.20	.45	.50
2	2.3	.1	.1	.05	2.4	2.3	.20	.45	.50
3	2.3	.1	.1	.69	2.4	2.25	.20	.50	.55
4	2.3	.1	.1	2.6	2.4	2.25	.20	.50	.62
5	2.25	.1	.1	2.6	2.4	2.25	.20	.55	.68
6	2.25	.1	.15	2.6	2.35	2.2	.20	.60	.70
7	2.25	.1	.15	2.6	2.35	2.2	.20	.60	.75
8	2.25	.1	.2	2.6	2.35	2.15	.30	.60	.80
9	2.2	.1	.2	2.6	2.35	2.15	.30	.60	.80
10	2.2	.1	.2	2.5	2.35	2.15	.30	.65	.80
11	2.15	.1	.15	2.5	2.35	2.15	.30	.65	.82
12	2.15	.1	.15	2.5	2.35	2.15	.25	.70	.82
13	2.15	.15	.15	2.5	2.35	2.15	.25	.70	.82
14	2.1	.15	.1	2.5	2.35	2.15	.25	.90	.82
15	2.1	.15	.1	2.5	2.35	2.15	.25	1.10	.80
16	2.05	.15	.1	2.5	2.35	2.15	.25	1.20	.80
17	2.05	.15	.1	2.5	2.3	2.1	.25	1.30	.78
18	2.0	.15	.1	2.5	2.45	2.1	.25	1.35	.78
19	2.0	.15	.1	2.45	2.8	2.1	.30	1.40	.75
20	.05	.15	.1	2.45	2.8	2.1	.40	1.40	.75
21	.05	.15	2.6	2.45	2.8	2.1	.40	1.40	.75
22	.05	.15	2.6	2.45	2.7	2.1	.40	1.40	.75
23	.05	.15	2.6	2.45	2.7	2.05	.35	1.45	.75
24	.05	.15	.1	2.45	2.7	2.05	.35	1.45	.75
25	.05	.1	.1	2.45	2.6	2.05	.35	2.2	.95
26	.05	.1	.1	2.45	2.5	2.0	.35	3.2	2.35
27	.1	.1	.1	2.45	2.45	.97	.35	1.47	2.3
28	.1	.1	.1	2.4	2.4	.10	.40	3.0	2.3
29	.1	.1	.1	2.4	......	.05	......	1.11	2.3
30	.1	.1	.05	2.4	......	.05	.55	.48	2.3
31	.1	......	.05	2.4	......	.05	......	.48	......

NOTE.— Discharge relation not affected by ice. On days when gates at Indian Lake were changed after January 1, the gage height is weighted, taking into consideration the time of changing gates.

Daily discharge, in second-feet, of Indian River near Indian Lake, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
1	353	1	1	0	385	369	2	12	15
2	353	1	1	0	385	353	2	12	15
3	353	1	1	30	385	338	2	15	18
4	353	1	1	453	385	338	2	15	24
5	338	1	1	453	385	338	2	18	29
6	338	1	1.5	453	369	322	2	22	31
7	338	1	1.5	453	369	322	2	22	36
8	338	1	2	453	369	307	5	22	41
9	322	1	2	453	369	307	5	22	41
0	322	1	2	418	369	307	5	26	41

Daily discharge, in second-feet, of Indian River near Indian Lake, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
11	307	1	1.5	418	369	307	5	26	43
12	307	1	1.5	418	369	307	3.5	31	43
13	307	1.5	1.5	418	369	307	3.5	31	43
14	292	1.5	1	418	369	307	3.5	53	43
15	292	1.5	1	418	369	307	3.5	80	41
16	278	1.5	1	418	369	307	3.5	95	41
17	278	1.5	1	418	353	292	3.5	111	39
18	264	1.5	1	418	402	292	3.5	120	39
19	264	1.5	1	402	526	292	5	129	36
20	.5	1.5	*a*114	402	526	292	9	129	36
21	.5	1.5	453	402	526	292	9	129	36
22	.5	1.5	453	402	489	292	9	129	36
23	.5	1.5	*a*340	402	489	278	7	138	36
24	.5	1.5	1	402	489	278	7	138	36
25	.5	1	1	402	453	278	7	322	60
26	.5	1	1	402	418	264	7	322	369
27	1	1	1	402	402	62	7	142	353
28	1	1	1	385	385	1	9	603	353
29	1	1	1	385	......	0	14	82	353
30	1	1	.5	385	......	0	18	14	353
31	1	......	.5	385	......	0	......	14	......

a Gates changed after gage was read. Discharge is weighted mean of discharge before and after change of gates.

NOTE.— Daily discharge determined from a well-defined rating curve. Station discontinued June 30, 1914.

Monthly discharge of Indian River near Indian Lake, N. Y., for the year ending September 30, 1914

[Drainage area, 132 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	353	.5	194	1.47	1.70	A
November	1.5	1	1.2	.009	.01	A
December	453	.5	44.9	.340	.39	A
January	453	0	376	2.85	3.29	A
February	526	353	409	3.10	3.23	A
March	369	0	260	1.97	2.27	A
April	18.5	2	5.6	.042	.05	B
May	603	12	97.5	.739	.85	A
June	369	15	89.4	.677	.76	A

NOTE.— These figures indicate the flow as regulated at the Indian Lake dam.

SCHROON RIVER AT RIVERBANK, N. Y.

Location.—At the highway bridge 12 miles above the confluence of Schroon river with the Hudson, 9 miles below the mouth of Schroon lake, about 3½ miles below the outlet of Brant lake, and 1 mile below the foot of Tumblehead falls. The station is about 9 miles north of Warrensburg, where there are several dams used for power development.

Records available.— September 2, 1907, to September 30, 1914.

Drainage area.— 534 square miles.

Gage.— Chain; read twice daily; datum unchanged.

Control.— Gravel; not permanent.

Discharge measurements.— Made from the bridge.

Regulation.— Since 1907 the regimen of flow of Schroon river, from the low-water period to the high, has been somewhat affected by storage in Schroon lake. In September, 1907, a timber crib dam was constructed at Starbuckville about 6 miles above the station. This dam affords a head of about 8 feet and ponds water to Schroon lake.

Winter flow.— Backwater from ice fluctuates rapidly and estimates for this period are approximate.

Accuracy.— Open-water curve fairly well developed. Gage heights are sometimes affected by backwater from log jams. Records as published are good.

Discharge measurements of Schroon River at Riverbank, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 2a	G. H. Canfield	1.36	114
2b	do	1.36	113
1914			
Jan. 1c	C. S. De Golyer	2.50	347
14c	do	2.88	349
27c	do	2.41	297
Feb. 4c	R. S. Barnes	2.15	320
17d	W. S. Easterly	2.40	278
Mar. 10d	R. S. Barnes	2.35	294
31e	O. W. Hartwell	3.49	908
April 22	W. S. Easterly	9.18	7,290
May 5	C. S. De Golyer	5.78	3,440
5	do	5.76	3,360
Sept. 15	E. D. Burchard	1.89	280

a Measurement made by wading ¼ mile below gage.
b Measurement made by wading ⅜ mile below gage.
c Backwater from ice.
d Backwater from ice. Measurement made through ice under bridge.
e Backwater from log jam.

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for the year ending September 30, 1914

[J. H. Roberts, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.22	1.8	2.4	2.35	1.8	2.3	3.9	6.8	3.1	2.2	1.47	1.55
2	1.36	1.8	2.4	2.9	2.1	2.5	4.4	6.7	2.35	2.25	1.5	1.55
3	1.34	1.8	2.3	2.85	2.1	2.5	4.7	6.3	2.3	2.3	1.55	1.6
4	1.30	1.85	2.3	2.5	2.05	2.5	4.7	6.0	2.3	1.55	1.5	1.55
5	1.30	1.9	2.3	2.4	2.1	2.45	4.8	5.8	2.7	1.6	1.5	1.55
6	1.35	1.85	2.3	2.5	2.05	2.5	4.7	5.6	2.3	1.55	1.5	1.65
7	1.35	1.85	2.25	2.5	2.1	2.45	4.6	5.4	2.3	1.6	1.48	1.55
8	1.34	1.85	2.3	2.3	2.1	2.5	4.8	5.1	2.35	1.6	1.48	1.5
9	1.39	1.9	2.35	2.35	2.6	2.5	5.4	4.9	2.75	1.55	1.45	1.65
10	1.38	2.0	2.4	2.3	2.8	2.8	5.7	4.7	2.4	1.55	1.46	1.75
11	1.30	2.05	2.55	2.85	2.15	2.25	6.0	4.2	2.9	1.5	1.44	1.85
12	1.30	2.15	2.45	2.8	2.4	2.3	6.0	3.9	3.0	1.5	1.45	1.9
13	1.40	2.15	2.5	2.85	2.3	2.3	5.9	4.0	2.85	1.6	1.46	1.75
14	1.42	2.15	2.5	3.0	2.2	2.25	5.7	4.0	2.45	1.6	1.45	1.85
15	1.45	1.8	2.5	2.9	2.0	2.2	5.7	4.1	3.1	1.55	1.45	1.85
16	1.45	2.15	2.45	2.4	2.2	2.1	5.7	4.1	3.2	1.6	1.4	1.85
17	1.40	2.2	2.45	2.5	2.5	2.0	5.8	4.0	2.6	1.6	1.43	1.9
18	1.45	2.2	2.45	2.8	2.4	2.1	5.9	4.0	2.55	1.6	1.41	1.85
29	1.45	2.2	2.4	2.7	2.3	2.1	6.3	4.0	2.35	1.55	1.44	1.85
10	1.65	2.3	2.3	2.6	2.2	2.1	7.5	3.4	2.3	1.55	1.46	1.8

Daily gage height, in feet, of Schroon River at Riverbank, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
21.....	1.7	2.4	2.3	2.6	2.2	2.2	9.1	3.1	1.55	1.55	1.5	1.85
22.....	1.6	2.45	2.35	2.7	2.35	2.05	9.2	3.6	2.35	1.55	1.48	1.85
23.....	1.6	2.5	2.3	2.6	2.1	2.1	8.6	3.2	2.35	1.55	1.5	1.8
24.....	1.6	2.5	2.25	2.45	2.3	2.15	8.0	3.2	2.25	1.55	1.48	1.75
25.....	1.7	2.55	2.3	2.4	2.2	2.1	7.6	3.1	2.35	1.6	1.44	1.8
26.....	1.75	2.5	2.35	2.5	2.3	2.15	7.1	3.1	2.25	1.5	1.45	1.8
27.....	1.8	2.5	2.3	2.5	2.3	2.25	7.0	3.1	1.44	1.6	1.46	1.8
28.....	2.15	2.5	2.5	2.4	2.3	2.65	6.9	3.3	1.65	1.55	1.39	1.75
29.....	2.45	2.45	2.5	2.35	......	2.85	6.8	2.9	2.15	1.5	1.55	1.7
30.....	2.4	2.4	2.55	2.3	......	3.2	6.9	2.65	2.05	1.5	1.5	1.7
31.....	2.1	......	2.45	2.0	......	3.6	......	2.65	......	1.5	1.6	......

NOTE.— Discharge relation affected by ice December 30 to January 31, February 2 to March 15, and by log jams March 31, and April 20 to 25.

Daily discharge, in second-feet, of Schroon River at Riverbank, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	83	230	450	347	230	......	1,380	4,940	810	370	138	159
2.....	112	230	450	495	......	......	1,850	4,790	430	390	146	159
3.....	108	230	410	468	......	......	2,170	4,200	410	410	159	172
4.....	99	246	410	430	......	......	2,170	3,780	410	159	146	159
5.....	99	262	410	410	......	......	2,280	3,510	590	172	146	159
6.....	110	246	410	394	......	......	2,170	3,250	410	159	146	186
7.....	110	246	390	378	......	......	2,060	3,000	410	172	141	159
8.....	108	246	410	378	......	......	2,280	2,640	430	172	141	146
9.....	119	262	430	382	......	......	3,000	2,400	615	159	134	186
10.....	117	296	450	370	......	......	3,380	2,170	450	159	136	215
11.....	99	314	518	362	......	......	3,780	1,660	695	146	131	246
12.....	99	351	472	355	......	......	3,780	1,380	750	146	134	262
13.....	121	351	495	351	......	......	3,640	1,470	668	172	136	215
14.....	126	351	495	349	......	......	3,380	1,470	472	172	134	246
15.....	134	230	495	347	......	......	3,380	1,560	810	159	134	246
16.....	134	351	472	......	......	332	3,380	1,560	870	172	121	246
17.....	121	370	472	......	......	296	3,510	1,470	540	172	128	262
18.....	134	370	472	......	......	332	3,640	1,470	518	172	124	246
19.....	134	370	450	......	......	332	4,200	1,470	430	159	131	246
20.....	186	410	410	......	......	332	5,420	1,000	410	159	136	230
21.....	200	450	410	......	......	370	7,050	810	159	159	146	246
22.....	172	472	430	......	......	312	7,250	1,140	430	159	141	246
23.....	172	495	410	......	......	332	6,660	870	430	159	146	230
24.....	172	495	390	......	......	351	6,110	870	390	159	141	215
25.....	200	518	410	......	......	332	5,760	810	430	172	131	230
26.....	215	495	430	......	......	351	5,420	810	390	146	134	230
27.....	230	495	410	......	......	390	5,260	810	121	172	136	230
28.....	351	495	390	......	......	565	5,100	935	186	159	119	215
29.....	472	472	390	......	......	668	4,940	695	351	146	159	200
30.....	450	450	390	......	......	723	5,100	565	314	146	146	200
31.....	332	......	370	......	......	935	......	565	......	146	172	......

NOTE.— Daily discharge values December 30 to January 15, and April 20 to 25 are approximate. See note following table of daily gage height. Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of Schroon River at Riverbank, N. Y., for the year ending September 30, 1914
[Drainage area, 534 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	472	83	172	.322	.37	A
November	518	230	360	.674	.75	A
December	518	370	432	.809	.93	A
January	495	....	334	.626	.72	B
February	....	....	282	.528	.55	C
March	935	....	373	.699	.80	B
April	7,250	1,380	3,980	7.45	8.31	A
May	4,920	565	1,870	3.51	4.05	A
June	870	121	478	.895	1.00	A
July	410	146	183	.343	.40	B
August	172	119	139	.261	.30	B
September	262	146	213	.399	.44	B
The year	7,250	83	733	1.37	18.62	.....

NOTE.— See "Regulation" in the station description. Mean discharge estimated for the following periods: January 16 to 31, 284 second-feet; March 1 to 15, 308 second-feet.

SACANDAGA RIVER NEAR HOPE, N. Y.

Location.—About 3½ miles above the post-office at Hope, 4 miles below the village of Wells, 12 miles above Northville (the nearest railroad station), and 1½ miles below the junction of the east and west branches of the Sacandaga.

Records available.— September 15, 1911, to September 30, 1914.

Drainage area.— 494 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Staff in two sections; a sloping staff reading from 1.0 to 4.3 feet; a vertical staff graduated above 4.3 attached to a rocky cliff in line with the sloping gage.

Control.— Regular and permanent.

Discharge measurements.—Made from a cable with a span of 214 feet during high stages and by wading at low stages.

Winter flow.— Discharge relation affected by ice. Gage observations suspended during winter.

Accuracy.— The open-water rating curve is very well defined and estimates for this period are good.

Discharge measurements of Sacandaga River near Hope, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Sept. 28*a*	C. S. De Golyer	1.78	137
30*b*	do	1.74	122

a Measurement made by wading at regular section.
b Measurement made by wading 300 feet below gage.

Daily gage height, in feet, of Sacandaga River near Hope, N. Y., for 1914
[Melvin Willis, observer]

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	1.58	2.9	2.8	4.4	5.9	2.5	1.85	1.66	2.7
2	1.94	2.8	2.75	5.2	5.6	2.42	1.82	1.65	2.6
3	2.44	2.65	2.8	......	4.9	2.35	1.95	1.60	2.9
4	2.16	2.7	2.85	4.4	4.9	2.5	1.88	1.59	2.75
5	2.00	2.7	2.85	4.4	4.8	2.65	1.80	1.45	2.55
6	1.84	2.65	2.8	4.0	4.6	2.48	2.08	1.40	2.45
7	1.86	2.55	3.05	3.9	4.6	2.4	2.18	1.40	2.5
8	1.79	2.5	4.2	5.1	4.1	2.5	2.5	1.42	2.42
9	1.74	5.7	3.5	6.4	4.2	2.48	2.48	1.45	2.25
10	1.70	6.2	3.5	5.4	4.3	2.34	2.38	1.45	2.18
11	1.68	4.8	3.45	5.0	4.2	2.26	2.38	1.50	2.12
12	1.75	4.4	3.1	4.9	4.4	2.22	2.55	1.52	2.05
13	1.76	4.0	3.15	4.6	4.2	2.12	2.38	1.45	2.00
14	1.74	3.8	3.1	4.6	4.4	2.09	2.20	1.50	1.95
15	1.68	3.6	3.05	4.8	4.3	1.99	2.15	1.55	1.88
16	1.62	3.45	2.95	4.9	4.2	1.96	2.12	1.53	1.85
17	1.72	3.3	2.85	5.0	3.8	2.02	2.08	1.50	1.88
18	1.57	3.2	2.8	5.8	3.4	1.88	2.10	1.51	1.85
19	1.64	3.1	2.55	7.1	3.6	1.85	2.02	1.55	1.78
20	2.75	3.8	2.7	8.3	3.15	1.92	1.94	1.62	1.75
21	4.0	3.8	2.6	7.6	3.15	1.86	1.90	2.12	1.75
22	3.3	3.6	2.55	6.6	3.0	1.80	1.92	2.21	1.72
23	3.0	3.5	2.65	6.4	3.0	1.76	1.88	1.96	1.70
24	2.85	3.4	2.55	5.8	2.9	1.68	1.90	1.90	1.72
25	3.6	3.3	2.5	5.6	3.1	1.70	1.86	1.88	1.80
26	4.0	3.15	2.5	6.1	3.0	1.65	1.82	1.80	1.80
27	3.9	3.0	2.5	6.1	2.8	1.62	1.78	1.70	1.80
28	3.6	2.9	......	6.1	2.75	1.60	1.74	1.80	1.79
29	3.4	2.9	2.3	6.4	2.7	2.00	1.70	3.3	1.75
30	3.3	2.85	......	6.3	2.85	1.90	1.70	3.7	1.72
31	3.1	......	2.75	......	2.6	......	1.70	3.0	......

NOTE.— Discharge relation affected by ice December 30 to March 31, inclusive.

Daily discharge, in second-feet, of Sacandaga River near Hope, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	92	740	666	2,560	6,070	456	160	101	590
2	212	666	632	4,230	5,250	411	150	98	520
3	440	566	666	3,400	3,540	374	197	85	740
4	303	598	703	2,560	3,540	456	171	83	625
5	235	598	703	2,560	3,330	555	143	53	488
6	174	566	666	1,920	2,930	445	248	45	428
7	182	504	860	1,780	2,930	400	291	45	456
8	157	474	2,230	3,990	2,070	456	456	48	411
9	140	5,520	1,290	7,530	2,230	445	445	53	324
10	127	6,930	1,290	4,730	2,390	369	390	53	291
11	121	3,330	1,240	3,760	2,230	329	390	63	265
12	144	2,560	900	1,920	2,560	310	488	67	236
13	147	1,920	945	2,930	2,230	265	390	53	216
14	140	1,650	900	2,930	2,560	252	300	63	197
15	121	1,400	860	3,330	2,390	212	278	73	171
16	103	1,240	780	3,540	2,230	201	265	69	160
17	134	1,090	703	3,760	1,650	224	248	63	171
18	89	990	666	5,790	1,190	171	256	65	160
19	109	900	504	9,900	1,400	160	224	73	137
20	632	1,650	598	15,000	955	186	90	90	127

Daily discharge, in second-feet, of Sacandaga River near Hope, N. Y., for the year ending September 30, 1914 — Continued

DAY.	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
21	1,920	1,650	534	11,800	955	164	178	265	127
22	1,090	1,400	504	8,160	820	143	186	305	118
23	820	1,290	566	7,530	820	130	171	201	122
24	703	1,190	504	5,790	740	106	178	178	118
25	1,400	1,090	474	5,250	910	112	164	171	143
26	1,920	945	474	6,640	820	98	150	143	143
27	1,780	820	474	6,640	660	90	137	112	143
28	1,400	740	420	6,640	625	85	124	143	140
29	1,190	740	367	7,530	590	216	112	1,090	127
30	1,090	703	367	7,230	700	178	112	1,520	118
31	900	......	367	......	520	......	112	820	......

NOTE.— Daily discharge determined from a well-defined rating curve. New rating curve used beginning April 1, 1914.

Monthly discharge of Sacandaga River near Hope, N. Y., for the year ending September 30, 1914
[Drainage area, 494 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,920	89	581	1.18	1.36	A
November	6,930	474	1,480	3.00	3.35	A
December	2,230	367	737	1.49	1.72	A
April	15,000	1,780	5,380	10.9	12.16	B
May	6,070	520	1,990	4.03	4.65	A
June	555	85	267	.540	.60	A
July	488	112	236	.478	.55	A
August	1,520	45	203	.411	.47	B
September	740	112	267	.540	.60	A

SACANDAGA RIVER AT HADLEY, N. Y.

Location.—About half a mile west of the railroad station at Hadley, 1 mile above the confluence of Sacandaga river with the Hudson, and 4½ miles below the site of the proposed storage dam at Conklingville. No tributaries between this station and the mouth of the river.

Records available.— September 13, 1907, to September 30, 1914.

Drainage area.— 1,060 square miles. (Measured on U. S. G. S. topographic sheets.)

Gage.— Recording hydrograph gage 30 feet downstream from the cable, in a concrete well 3 feet square, inside dimension. The well is connected with the river by a 4-inch cast-iron water pipe. There is a hook gage in the well to assist in setting the automatic gage and an auxiliary sloping staff gage is located outside.

Control.— Very rough but permanent.

Discharge measurements.— Made from the cable at medium and high stages and wading about three-fourths mile upstream at low stages. The channel at the cable has been cleared of bowlders.

Winter flow.— The water in the well and in the intake pipe never freezes over because its level is below the frost line. The discharge relation is, however, considerably affected by ice.

Accuracy.— The discharge rating curve that has been developed for this station is well defined.

Discharge measurements of Sacandaga River at Hadley, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Dec. 30	C. S. De Golyer	4.67	894
1914			
Jan. 12*a*	do	3.93	566
17*a*	do	4.44	547
28*b*	do	4.28	659
Feb. 2*a*	R. S. Barnes	4.59	1,130
24*c*	do	4.72	736
Mar. 11*c*	do	4.19	686

a Measurement made from lower bridge 1,500 ft. below gage.
b Measurement made through ice one-half mile above gage.
c Measurement made through ice 200 ft. above gage.

Daily gage height, in feet, of Sacandaga River at Hadley, N. Y., for the year ending September 30, 1914

[J. F. Kelly, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	2.69	4.3	4.05	4.55	4.55	3.65	6.65	7.7	3.65	3.12	2.60	4.32
2	2.73	4.1	4.0	4.85	4.55	4.40	6.9	7.5	3.55	2.95	2.63	4.02
3	2.97	3.9	4.0	4.8	4.55	4.75	7.1	7.2	3.46	2.98	2.61	3.88
4	3.4	3.85	4.1	4.55	4.41	4.38	7.4	6.75	3.47	3.00	2.59	3.91
5	3.3	3.8	4.15	4.35	4.55	4.18	7.4	6.55	3.63	3.00	2.55	3.80
6	3.15	3.8	4.15	4.43	4.7	4.08	6.9	6.45	3.75	2.98	2.54	3.61
7	3.05	3.75	4.2	4.30	4.45	4.05	6.45	6.35	3.64	3.03	2.50	3.48
8	2.95	3.7	5.1	4.14	4.48	4.01	6.45	6.15	3.56	3.43	2.48	3.42
9	2.88	4.5	5.4	4.05	4.5	3.98	7.2	5.9	3.57	3.55	2.48	3.35
10	2.83	6.5	5.2	3.99	4.45	3.98	7.9	5.75	3.59	3.41	2.46	3.23
11	2.80	7.0	5.0	3.95	4.5	3.95	7.9	5.55	3.50	3.33	2.45	3.15
12	2.76	7.0	4.5	3.91	4.55	3.88	7.6	5.4	3.38	3.39	2.43	3.08
13	2.75	6.6	4.45	3.95	4.5	3.85	7.3	5.55	3.28	3.40	2.44	3.01
14	2.76	6.2	4.5	4.26	4.55	3.82	7.1	5.7	3.21	3.32	2.45	2.97
15	2.76	5.8	4.4	4.5	......	3.75	6.95	5.75	3.15	3.20	2.46	2.93
16	2.72	5.4	4.25	4.6	......	3.90	6.95	5.65	3.10	3.10	2.46	2.84
17	2.72	5.0	4.2	4.38	......	4.20	6.95	5.45	3.07	3.08	2.48	2.83
18	2.71	4.7	4.15	4.4	5.45	4.35	7.0	5.2	3.02	3.03	2.47	2.82
19	2.72	4.5	3.95	4.55	5.2	4.38	7.5	4.95	2.97	3.01	2.49	2.79
20	2.92	4.6	3.65	4.38	4.9	4.5	8.6	4.7	2.95	2.97	2.53	2.77
21	4.15	5.1	3.75	4.3	4.85	4.55	9.9	4.45	2.94	2.91	2.71	2.75
22	4.35	5.2	3.8	4.35	4.75	4.36	10.0	4.35	2.95	2.86	2.95	2.73
23	4.5	5.0	3.65	4.44	4.65	4.32	9.3	4.25	2.95	2.84	3.15	2.71
24	4.15	4.8	3.5	4.32	4.55	4.24	8.6	4.15	2.92	2.84	3.08	2.70
25	4.25	4.7	3.65	4.25	4.48	4.15	8.0	4.02	2.83	2.84	2.92	2.69
26	5.0	4.5	3.6	4.65	4.25	4.18	7.7	3.98	2.75	2.83	2.86	2.70
27	5.5	4.35	3.7	4.65	3.85	4.65	7.6	4.03	2.78	2.79	2.83	2.71
28	5.4	4.2	4.25	4.29	3.70	5.55	7.6	3.91	2.78	2.75	2.80	2.72
29	5.1	4.1	4.7	4.13	......	6.1	7.6	3.82	2.80	2.70	3.14	2.74
30	4.8	4.1	4.7	4.19	......	6.35	7.7	3.75	2.83	2.69	4.55	2.73
31	4.6	......	4.6	4.26	......	6.5	......	3.78	......	2.63	4.75	......

NOTE.— Discharge relation affected by ice December 25 to March 31, inclusive.

Daily discharge, in second-feet of Sacandaga River at Hadley, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	214	1,500	1,220	778	1,060	552	6,260	9,500	821	436	176	1,580
2.....	232	1,270	1,160	698	1,090	1,220	6,980	8,820	738	339	189	1,180
3.....	350	1,060	1,160	864	1,110	1,630	7,580	7,880	668	355	180	1,040
4.....	622	1,010	1,270	864	956	1,220	8,500	6,540	675	366	172	1,060
5.....	552	956	1,330	910	1,110	1,010	8,500	5,980	804	366	157	956
6.....	455	956	1,330	1,010	1,060	864	6,980	5,720	910	355	153	787
7.....	395	910	1,380	864	1,010	738	5,720	5,460	812	383	138	683
8.....	339	864	2,710	738	1,060	660	5,720	4,960	746	645	131	637
9.....	302	1,760	3,270	660	1,060	587	7,880	4,360	754	738	131	587
10.....	278	5,850	2,890	622	1,010	552	10,200	4,020	770	630	124	506
11.....	263	7,280	2,540	587	......	519	10,200	3,580	698	573	121	455
12.....	245	7,280	1,760	552	......	486	9,160	3,270	608	615	114	412
13.....	240	6,120	1,700	552	......	455	8,180	3,580	539	622	118	372
14.....	245	5,080	1,760	587	......	424	7,580	3,900	493	566	121	349
15.....	245	4,130	1,630	587	......	395	7,130	4,020	455	486	124	328
16.....	227	3,270	1,440	660	......	486	7,130	3,790	424	424	124	283
17.....	227	2,540	1,380	519	......	698	7,130	3,370	407	412	131	277
18.....	222	2,050	1,330	519	......	821	7,280	2,890	378	383	128	272
19.....	227	1,760	1,110	622	......	864	8,820	2,460	350	372	135	258
20.....	323	1,900	821	519	......	956	12,900	2,050	339	350	149	250
21.....	1,330	2,710	910	455	......	1,010	19,000	1,700	334	317	222	240
22.....	1,570	2,890	956	486	......	821	19,500	1,570	339	292	339	232
23.....	1,760	2,540	821	552	......	778	16,000	1,440	339	283	455	222
24.....	1,830	2,210	698	552	622	738	12,900	1,330	323	283	412	218
25.....	1,440	2,050	660	587	622	660	10,600	1,180	278	283	323	214
26.....	2,540	1,760	660	910	587	698	9,500	1,140	240	278	292	218
27.....	3,470	1,570	738	956	552	956	9,160	1,190	254	258	278	222
28.....	3,270	1,380	821	660	552	1,630	9,160	1,070	254	240	263	227
29.....	2,710	1,270	864	552	......	2,710	9,160	976	263	218	449	236
30.....	2,210	1,270	864	587	......	3,900	9,500	910	278	214	1,830	232
31.....	1,900	......	864	622	......	5,330	......	938	......	189	2,130	......

NOTE.— Daily discharge values during the frozen periods December 25 to February 10, and February 24 to March 31, are only approximate. Daily discharge determined from well-defined rating curve.

Monthly discharge of Sacandaga River at Hadley, N. Y., for the year ending September 30, 1914
[Drainage area, 1,060 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	3,470	214	959	0.905	1.04	A
November..................	7,280	864	2,570	2.42	2.70	A
December..................	3,270	660	1,360	1.28	1.48	B
January....................	....	....	666	.628	.72	B
February..................	....	....	839	.792	.82	C
March......................	....	....	1,110	1.05	1.21	B
April........................	19,500	5,720	9,480	8.94	9.97	A
May.........................	9,500	910	3,540	3.34	3.85	A
June........................	910	240	510	.481	.54	A
July.........................	738	189	396	.374	.43	A
August.....................	2,130	114	316	.298	.34	A
September.................	1,530	214	482	.455	.51	A
The year..................	19,500	114	1,840	1.74	23.61	......

WEST BRANCH OF SACANDAGA RIVER AT BLACKBRIDGE NEAR WELLS, N. Y.

Location.—At the highway bridge known as Blackbridge, about 3 miles west of Wells and 2 miles above the junction of the east and west branches of Sacandaga river.

Records available.— March 14, 1911, to September 30, 1914.

Drainage area.— 211 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Chain, attached to upstream side of the highway bridge; read twice daily; datum unchanged.

Control.— Rocky and rough.

Discharge measurements.— Made from the bridge or by wading.

Regulation.— Gage heights slightly affected by storage dams used for logging in the spring.

Winter flow.— Discharge relation affected by ice. Gage observations suspended during the frozen period.

Measurements made during 1914 indicate a shift in the control of this station. Sufficient data for computing estimates of discharge are not available at this time.

Discharge measurements of West Branch of Sacandaga River at Blackbridge, near Wells, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Sept. 29*a*	C. S. De Golyer	2.80	60.8
29*a*	do	2.79	57.1

a Measurement made by wading at regular section.

Daily gage height, in feet, of West Branch of Sacandaga River at Blackbridge, near Wells, N. Y., for the year ending September 30, 1914

[Cornelius DeGroff, observer]

DAY	Oct.	Nov.	Dec.	Jan.	April	May	June	July	Aug.	Sept.
1	2.72	4.3	3.9	3.9	5.15	6.8	3.32	2.88	2.55	3.8
2	3.41	4.1	3.9	4.3	5.45	6.0	3.30	2.92	2.62	3.9
3	3.80	4.0	3.85	4.7	6.2	6.2	3.25	2.90	2.58	4.3
4	3.65	4.5	3.8	4.55	6.0	5.4	3.40	2.72	2.52	4.3
5	3.40	4.1	3.85	4.2	5.6	6.0	3.6	2.82	2.52	4.25
6	3.26	3.95	3.8	4.2	5.35	5.6	3.5	3.22	2.55	4.0
7	3.18	3.9	3.7	4.3	5.1	5.35	3.40	3.5	2.45	3.8
8	3.10	3.8	5.15	4.8	6.5	5.15	3.6	3.7	2.45	3.7
9	3.05	6.2	4.75	4.1	7.2	5.05	3.6	3.6	2.45	3.5
10	2.95	6.4	4.65	3.9	5.8	5.15	3.45	3.6	2.40	3.42
11	2.91	5.9	4.5	......	5.1	5.15	3.32	3.7	2.40	3.32
12	2.90	5.6	4.35	......	6.2	5.4	3.30	3.55	2.50	3.25
13	3.00	5.15	4.3	......	5.8	5.9	3.20	3.5	2.45	3.20
14	2.90	5.1	4.2	......	5.7	5.45	3.10	3.32	2.45	3.20
15	2.68	5.4	4.1	......	5.8	5.3	3.12	3.32	2.55	3.5
16	2.66	4.65	4.35	......	5.8	5.3	3.00	3.05	2.60	3.00
17	2.80	4.5	4.0	......	5.9	5.0	2.90	3.05	2.60	2.95
18	2.84	4.45	3.9	......	6.2	4.75	2.90	3.22	2.60	2.95
19	2.82	4.3	3.7	......	7.5	4.55	2.90	3.12	2.55	2.80
20	4.2	5.2	3.7	......	9.1	4.4	2.95	3.00	2.52	2.85
21	5.15	5.3	3.7	......	8.4	4.2	2.90	2.72	3.42	2.82
22	4.9	5.0	3.6	......	7.9	4.1	2.82	2.60	3.45	2.75
23	4.4	5.35	3.7	......	7.2	4.0	2.80	2.62	3.12	2.85
24	4.3	4.75	3.65	......	7.0	3.9	2.80	2.92	3.15	2.85
25	5.3	4.6	3.55	......	7.2	3.8	2.72	2.65	3.12	2.90
26	5.45	4.45	3.55	......	7.0	3.75	2.70	3.15	2.90	2.80
27	5.25	4.3	3.42	......	7.2	3.7	2.65	3.55	2.82	2.82
28	4.65	4.2	3.5	......	7.0	3.7	2.68	3.02	2.95	2.90
29	4.9	4.3	3.40	......	7.3	3.6	2.52	2.75	4.8	2.85
30	4.6	4.2	3.5	......	7.2	3.48	2.32	2.70	4.2	2.70
31	4.5	......	3.8	......	......	3.40	......	2.68	4.0	......

NOTE.— Discharge relation affected by ice December 30 to March 31, inclusive.

Daily discharge, in second-feet, of West Branch of Sacandaga River at Blackbridge, near Wells, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.
1	28	414	251
2	122	326	251
3	218	287	234
4	176	517	218
5	120	326	234
6	96	269	218
7	83	251	189
8	72	218	968
9	65	2,120	667
10	52	2,430	604
11	47	1,720	517
12	46	1,380	439
13	58	968	414
14	46	926	368
15	24	1,180	326
16	23	604	439
17	36	517	287
18	40	490	251
19	38	414	189
20	368	1,010	189
21	968	1,090	189
22	770	846	163
23	464	1,140	189
24	414	667	176
25	1,090	573	152
26	1,230	490	152
27	1,050	414	124
28	604	368	140
29	770	414	120
30	573	368	140
31	517	......	140

NOTE.— Daily discharge October 1 to December 31, determined from well-defined rating curve Measurements made during 1914 indicate that this rating curve has shifted during the floods or the frozen period. New rating curve not yet available.

Monthly discharge of West Branch of Sacandaga River at Blackbridge, N. Y., for the year ending September 30, 1914

[Drainage area, 211 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,230	23	329	1.56	1.80	A
November	2,430	218	758	3.59	4.00	A
December	968	120	288	1.36	1.57	A

HOOSIC RIVER NEAR EAGLE BRIDGE, N. Y.

Location.— One and one-half miles above the village of Eagle Bridge and one-half mile below the mouth of Walloomsac river. Owlkill creek enters the Hoosic at Eagle Bridge. Replaces station formerly maintained at Buskirk (four miles downstream), which was abandoned because the discharge relation was affected by backwater from a newly-constructed dam at Johnsonville.

Records available.—August 13, 1910, to September 30, 1914. For the station formerly maintained at Buskirk, four miles below, records are available from September 25, 1903, to December 31, 1908.

Drainage area.— 512 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Sloping staff gage on left bank opposite James Russell's. This gage was installed August 17, 1914, and replaces a standard chain gage supported by cantilever arm on tree on the left bank about 400 feet upstream.

Control.— Gravel; likely to shift.

Discharge measurements.—At low stages made by wading; at high stages made from the cable one-half mile below the gage.

Regulation.— The dam of Walter A. Wood & Co. is located at Hoosic Falls, about two miles above the gage. Walloomsac river is also partly controlled, and the effect of the operation of the mills is observable at the gage. For this reason the gage heights should be used with caution.

Accuracy.— Discharge rating curve well defined so that the accuracy of the estimates depends on the gage heights.

Co-operation.— Established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Hoosic River near Eagle Bridge, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
May 15	R. S. Barnes	10.12	1,640
22	C. S. De Golyer	9.16	790
Aug. 17*a*	do	*b*7.73	152

a Measurement made by wading 300 feet above the slope gage.
b Slope gage reading for this measurement was 3.31 feet.

Daily gage height, in feet, of Hoosic River near Eagle Bridge, N. Y., for the year ending September 30, 1914

[Mrs. Vashti Russell, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	6.88	8.1	8.3	7.55	......	10.8	11.1	8.55	7.95	7.62	3.65
2	6.90	7.65	8.05	7.90	......	......	10.7	8.45	7.95	7.62	3.55
3	7.00	7.85	8.0	8.0	......	11.8	10.5	8.4	8.05	7.42	3.52
4	7.00	7.90	7.80	7.50	......	10.6	10.4	8.35	7.90	7.48	3.40
5	6.82	7.60	8.1	8.05	......	10.2	10.7	9.2	7.98	7.60	3.26
6	7.18	7.60	8.0	8.0	......	9.8	10.8	8.85	9.1	7.60	2.99
7	6.98	7.50	8.0	7.70	......	9.8	10.6	8.35	8.4	7.45	3.02
8	6.85	7.40	9.9	7.80	......	11.3	10.3	8.5	8.7	7.70	3.29
9	6.92	7.30	9.1	7.65	......	......	10.1	8.55	8.5	7.45	3.35
10	6.92	11.1	8.8	7.75	......	11.8	10.0	8.3	8.8	7.40	3.12
11	6.88	9.3	8.8	7.60	......	11.0	10.1	8.25	8.5	7.45	3.32
12	6.52	8.7	8.6	8.2	......	11.4	10.0	8.25	8.25	7.65	3.06
13	7.38	8.4	8.5	8.5	......	11.0	11.4	8.1	8.4	7.60	2.99
14	7.70	8.3	8.7	8.5	......	10.5	10.9	7.60	8.2	7.72	3.10
15	6.98	8.4	8.6	8.4	......	10.6	10.6	8.2	8.0	7.72	3.12
16	7.05	8.15	8.45	9.0	......	10.6	......	8.35	7.85	7.42	3.22
17	6.90	8.25	8.4	9.0	12.7	10.3	......	8.3	7.85	......	3.20
18	6.85	8.0	8.4	......	10.3	10.6	......	7.95	8.0	3.34	3.14
19	6.55	8.0	8.3	......	9.1	11.4	......	8.0	7.72	3.48	2.98
20	7.15	8.7	8.15	......	8.6	......	......	7.80	7.95	3.08	2.90

Daily gage height, in feet, of Hoosic River, near Eagle Bridge, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
21	8.1	8.8	8.0	......	8.3	......	......	7.60	7.98	3.64	2.88
22	7.80	8.5	8.3	......	8.2	12.1	9.1	8.1	7.72	4.05	3.25
23	7.80	8.2	8.0	......	8.45	11.6	9.0	8.05	7.72	3.52	3.12
24	7.55	8.4	8.1	......	8.25	11.1	8.8	7.85	7.88	3.52	3.01
25	7.80	8.2	8.0	......	8.9	10.9	8.85	7.78	7.65	3.52	3.34
26	8.9	8.2	8.2	......	11.3	11.4	8.8	7.60	7.48	3.40	2.78
27	10.5	7.80	7.80	......	12.8	11.6	8.7	7.62	7.65	3.42	2.98
28	9.1	8.4	7.70	......	......	11.5	8.7	7.38	7.68	3.28	3.06
29	8.6	8.1	8.2	......	12.5	11.4	8.6	7.90	7.68	3.38	3.38
30	8.3	8.05	8.05	......	11.2	11.9	8.25	8.0	7.65	3.82	3.26
31	8.05	......	8.0	......	10.8	......	8.4	......	7.65	3.92	......

NOTE.— Discharge relation affected by ice January 13 to March 16, inclusive. The tree supporting the gage was undermined, causing it to settle some time after the high water of April. Comparison with the flow of the Hoosic at Schaghticooke indicates that this probably took place during the night of April 26. The gage was settling gradually May 16 to 21, when it fell into the river. Temporary gage used May 22 to August 16, inclusive. Permanent sloping staff gage installed August 18.

Daily discharge, in second-feet, of Hoosic River near Eagle Bridge, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.
1	112	620	745	332	......	2,880	2,000	460	215	125
2	116	378	590	505	......	6,520	1,640	412	215	125
3	140	478	560	560	......	4,120	1,480	390	248	84
4	140	505	450	310	......	2,670	1,400	368	200	96
5	98	355	620	590	......	2,280	1,640	820	224	120
6	189	355	560	560	......	1,910	1,730	618	760	120
7	135	310	560	400	......	1,910	1,560	368	390	90
8	105	270	2,000	450	......	3,460	1,320	435	535	145
9	121	230	1,320	378	......	6,860	1,160	460	435	90
10	121	3,220	1,090	425	......	4,120	1,090	345	590	80
11	112	1,480	1,090	355	......	3,100	1,160	325	435	90
12	48	1,020	950	680	......	3,580	1,090	325	325	132
13	262	810	880	......	......	3,100	2,280	265	390	120
14	400	745	1,020	......	......	2,570	1,820	120	305	150
15	135	810	950	......	......	2,670	1,560	305	230	150
16	152	650	845	......	......	2,670	......	368	185	84
17	116	712	810	......	5,530	2,380	......	345	185	152
18	105	560	810	......	2,380	2,670	......	215	230	......
19	52	560	745	......	1,310	3,580	......	230	150	......
20	180	1,020	650	......	950	6,360	......	170	215	......
21	620	1,090	560	......	745	6,520	......	120	224	......
22	450	880	745	......	680	4,560	760	265	150	......
23	450	680	560	......	845	3,840	700	248	150	......
24	332	810	620	......	712	3,220	590	185	194	......
25	450	680	560	......	1,160	2,990	618	165	132	......
26	1,160	680	680	......	3,460	3,580	590	120	96	......
27	2,570	450	450	......	5,700	2,470	535	125	132	......
28	1,320	810	400	......	6,860	2,380	535	76	140	......
29	950	620	680	......	5,200	2,280	485	200	140	......
30	745	590	590	......	3,340	2,780	325	230	132	......
31	590	......	560	......	2,880	......	390	......	132	......

NOTE.— Daily discharge, April 27 to May 15, computed on assumption that gage was reading 1.2 feet high during that period. Daily discharge, October 1 to May 15, determined from well-defined rating curve. Daily discharge, May 22 to August 16, based on rating curve that is not well defined.

Monthly discharge of Hoosic River near Eagle Bridge, N. Y., for the year ending September 30, 1914

[Drainage area, 512 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	2,570	48	402	0.785	0.90	B
November	1,480	230	746	1.46	1.63	A
December	2,000	400	763	1.49	1.72	A
January 1-12	680	310	462	.902	.40	.....
March	6,860	....	1,740	3.40	3.92	C
April	6,860	1,910	3,470	6.78	7.57	B
May	2,280	325	1,130	2.21	2.55	B
June	820	76	303	.592	.66	B
July	760	96	261	.510	.59	B

NOTE.— Mean discharge estimated by comparison with flow at Schaghticoke as follows: March 1-16, 760 second-feet; May 16-21, 1,090 second-feet.

MOHAWK RIVER AT VISCHER FERRY DAM, N. Y.

Location.—At the Vischer Ferry dam about 7 miles below Schenectady and 10 miles above the mouth of the river at Cohoes, replacing the station at Vischers Ferry about 1 mile below the dam.

Records available.— June 24, 1913, to September 30, 1914.

Drainage area.— 3,400 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Gurley weight driven printing gage set over float well in the northwest corner of the basin above the dam. The gage records the actual head of water on the rest of the spillway.

Discharge measurements.— Made by wading below the dam at low water. No provision for measurements at medium and high stages.

Diversions.—Water is diverted into the Erie canal at the temporary lock in the north end of the dam and the gage recording the head on the spillway makes no record of the water passing into the canal. Occasional measurements of the flow in this canal have been made at Bridge 48, about 1 mile downstream which are listed below.

Accuracy.— Conditions are fairly good for wading measurements and the estimates for low stages are good.

Discharge measurements of Mohawk River at Vischer's Ferry dam, N. Y., during the year ending September 30, 1914

DATE		Made by	Gage Height		Discharge
			Recording	Slope	
1913				*Feet*	*Sec.-ft.*
Nov.	5*a*	De Golyer and Barnes	....	3.40	2,070
	7*a*	do	....	3.51	2,250
	18*b*	Canfield and Barnes	....	4.20	4,420
1914					
Jan.	21*c*	R. S. Barnes	0.475	3.74	1,920
Mar.	2*d*	De Golyer and Easterly	.51	4.60	1,670
	16*e*	do	.67	4.48	2,880
June	15*f*	Hartwell and Barnes	.438	3.14	1,260
Aug.	24*g*	do	.494	....	1,830
Sept.	9*g*	Hartwell and Adams	.467	3.20	1,630
	15*h*	Pierce and Adams	.290	2.70	601
	24*i*	Hartwell, Barnes, Adams	.261	2.74	645

a Measurement made by wading 1,500 feet below slope gage.
b Measurement made by wading 2,000 feet below slope gage.
c Measurement made through ice about 200 feet below slope gage.
d Measurement made through ice at slope gage.
e Measurement made through ice ¼ mile below slope gage.
f Measurement made by wading about 2,500 feet above slope gage.
g Measurement made by wading about 1,000 feet below dam gage.
h Measurement made by wading about 6,000 feet below dam gage.
i Measurement made by wading about 8,000 feet below dam gage.

Discharge measurements of Erie Canal at Vischer's Ferry dam, N. Y., during the year ending September 30, 1914

DATE		Made by	Gage height	Discharge
1913			*Feet*	*Sec.-ft.*
Oct.	15	C. S. De Golyer	1.46	366
	15	do	1.42	290
Nov.	5	R. S. Barnes	3.27	300
	7	do	3.58	270
	18	do	1.29	354
1914				
June	15	M. J. Maguire	1.60	349
	22	do	1.54	437
	29	do	1.81	399
July	6	do	1.44	308
	13	do	1.66	420
	20	do	1.59	417
	27	do	1.87	543
	27	do	1.66	378
Aug.	3	do	2.10	302
	10	do	1.38	412
	17	do	1.66	422
	24	do	1.30	360
	31	do	1.56	336
Sept.	7	do	1.76	428
	13	do	1.50	418
	24	R. S. Barnes	1.48	350

Daily gage height, in feet, of Mohawk River at Vischer's Ferry dam, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	3.02	3.5	3.75	0.54	1.40	......	15.5	13.95	3.09	0.30	0.25	0.72
2.....	2.98	3.55	4.3	.50	1.34	0.51	15.6	13.9	3.08	.34	.24	.58
3.....	3.00	3.40	4.4	.48	1.15	......	15.2	13.5	.42	.35	.25	.55
4.....	3.10	3.44	4.2	.48	1.09	......	14.8	13.4	.46	.33	.26	.63
5.....	3.46	3.36	3.85	.49	1.05	......	14.2	13.55	.42	.31	.26	.60
6.....	3.35	3.28	3.65	.48	1.06	......	14.0	13.4	.40	.30	.26	.52
7.....	3.22	3.5	5.0	.47	1.08	......	13.8	13.6	.44	.35	.25	.41
8.....	3.22	3.24	4.9	.48	1.03	......	13.9	13.85	.50	.39	.25	.41
9.....	2.89	3.5	5.8	.49	.94	......	16.2	13.75	.53	.40	.24	.48
10.....	3.05	12.2	4.5	.49	.87	......	15.1	13.6	.61	.42	.25	.43
11.....	2.95	10.0	4.5	.44	.82	......	14.7	13.6	.53	.42	.25	.42
12.....	2.89	7.0	4.1	.49	.73	......	14.5	13.7	.49	.51	.23	.30
13.....	2.98	5.6	4.2	.39	.69	......	14.6	13.8	.48	.46	.23	.24
14.....	2.99	5.0	4.2	......	.70	......	14.1	13.9	.40	.35	.24	.24
15.....	2.91	5.1	4.8	......	.68	......	14.0	13.75	.42	.38	.22	.29
16.....	2.92	4.8	4.4	......	.61	.67	14.2	13.45	.35	.36	.21	.32
17.....	2.97	4.4	.87	......	.55	......	14.2	13.25	.33	.40	.20	.31
18.....	2.96	4.1	.71	......	......	......	14.3	13.0	.28	.39	......	.29
19.....	2.94	4.1	.66	......	......	......	14.4	12.9	.26	.26	......	.30
20.....	2.98	4.5	.59	......	......	......	15.1	12.8	.24	.27	......	.32
21.....	3.13	6.1	.57	.48	......	......	16.0	12.8	.29	.27	......	.29
22.....	5.5	5.7	.57	.48	......	......	14.9	12.7	.28	.27	......	.26
23.....	4.8	5.1	.53	.49	......	......	14.5	12.7	.28	.28	......	.28
24.....	4.4	4.4	.53	.52	......	......	14.1	3.35	.27	.28	.45	.28
25.....	3.9	4.1	.60	.51	......	......	14.0	3.04	.25	.28	......	.26
26.....	4.0	4.4	.53	.50	......	......	14.2	3.26	.27	.26	......	.26
27.....	4.8	4.0	.41	.54	......	......	14.0	3.23	.31	.27	......	.27
28.....	5.1	3.9	.38	.59	......	......	13.75	3.26	.33	.27	......	.26
29.....	4.3	3.8	.48	.65	......	......	14.2	3.20	.40	.28	......	.25
30.....	4.2	3.6	.50	.84	......	15.9	14.1	3.29	.32	.28	......	.23
31.....	4.1	......	.55	1.27	......	15.3	......	3.05	......	.28	......	......

NOTE.— Gage height observed as follows: October 1 to December 16, and May 24 to June 2' from sloping staff gage at Vischer's Ferry; March 30 to May 23, inclusive, from gage in concrete at lock; December 17 to February 17 and June 3 to September 30, inclusive, from automatic gage above the dam. Gage height record from February 18 to March 29, lost when gage was carried out by ice.

Daily discharge, in second-feet, of Mohawk River at Vischer's Ferry dam, for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	986	2,230	2,980	2,130	10,100	......	39,200	15,600	1,370	710	510	3,520
2.....	900	2,380	4,760	1,850	9,440	1,670	41,000	14,900	1,340	900	470	2,410
3.....	940	1,950	5,110	1,710	7,500	......	34,100	10,100	1,340	950	510	2,200
4.....	1,170	2,060	4,420	1,710	6,900	......	27,600	9,000	1,580	850	550	2,800
5.....	2,120	1,840	3,280	1,780	6,500	......	18,900	10,600	1,340	750	550	2,560
6.....	1,820	1,630	2,670	1,710	6,600	......	16,200	9,000	1,220	710	550	1,990
7.....	1,470	2,230	7,380	1,640	6,800	......	13,600	11,200	1,460	950	510	1,280
8.....	1,470	1,520	6,980	1,710	6,300	......	14,900	14,200	1,850	1,160	510	1,280
9.....	722	2,230	10,700	1,780	5,460	......	52,100	13,000	2,060	1,220	470	1,710
10.....	1,060	......	5,470	1,780	4,830	......	32,400	11,200	2,640	1,340	510	1,400
11.....	840	......	5,470	1,460	4,380	......	26,100	11,200	2,060	1,340	510	1,340
12.....	722	......	4,090	1,780	3,600	......	23,100	12,400	1,780	1,920	440	710
13.....	900	9,840	4,420	1,160	3,280	......	24,600	13,600	1,710	1,580	440	470
14.....	920	7,380	4,420	......	3,360	......	17,500	14,900	1,220	950	470	470
15.....	760	7,780	6,590	......	3,200	......	16,200	13,000	1,340	1,100	410	670
16.....	780	6,590	5,110	......	2,640	2,880	18,900	9,600	950	1,000	380	800
17.....	880	5,110	4,830	......	2,200	......	18,900	7,500	850	1,220	350	750
18.....	860	4,090	3,440	......	......	......	20,300	5,100	630	1,160	......	670
19.....	820	4,090	3,040	......	......	......	21,700	4,200	550	550	......	710
20.....	900	5,470	2,480	......	......	......	32,400	3,360	470	590	......	800

Daily discharge, in second-feet, of Mohawk River at Vischer's Ferry dam for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
21	1,240	12,000	2,340	1,710	......	......	48,300	3,360	670	590	......	670
22	9,420	10,300	2,340	1,710	......	......	29,200	2,560	630	590	......	550
23	6,590	7,780	2,060	1,780	......	......	23,100	2,560	630	630	......	630
24	5,110	5,110	2,060	1,990	......	......	17,500	2,040	590	630	1,520	630
25	3,440	4,090	2,560	1,920	......	......	16,200	1,250	510	630	......	550
26	3,760	5,110	2,060	1,850	......	......	18,900	1,800	590	550	......	550
27	6,590	3,760	1,280	2,130	......	......	16,200	1,720	750	590	......	590
28	7,780	3,440	1,100	2,480	......	......	13,000	1,800	850	590	......	550
29	4,760	3,130	1,710	2,960	......	......	18,900	1,640	1,220	630	......	510
30	4,420	2,520	1,850	4,560	......	46,400	17,500	1,870	800	630	......	440
31	4,090	......	2,200	8,700	......	35,800	......	1,270	......	630	......	......

NOTE.— Daily discharge, October 1 to December 16, and May 24 to June 2, determined from a well-defined rating curve. Rating curve applicable to remainder of the period fairly well defined below discharge, 2,500 second-feet. Rating was extended above this point by the use of theoretic formulas.

Monthly discharge of Mohawk River at Vischer's Ferry dam, N. Y., for the year ending September 30, 1914

MONTH	DISCHARGE IN SECOND-FEET			Accuracy
	Maximum	Minimum	Mean	
October	9,420	722	2,520	B
November	....	1,520	6,640	C
December	10,700	1,100	3,840	B
January	8,700	1,160	2,130	B
February	10,100	....	3,910	C
March	....	....	8,000	D
April	52,100	13,000	24,300	C
May	15,600	1,270	7,280	B
June	2,640	470	1,170	A
July	1,920	550	892	A
August	....	....	891	B
September	3,520	440	1,140	A
The year	....	....	5,200	.....

NOTE.— These figures indicate only the flow over the spillway.

ALPLAUS KILL NEAR CHARLTON, N. Y.

Location.—At the highway bridge about one-half mile southwest of Charlton.

Records available.— August 12, 1913, to September 30, 1914.

Drainage area.— 24.9 square miles.[1]

Gage.—Automatic electric water stage register in a 5 by 6 foot wooden house over a 2½ by 6-foot timber well. The well is connected with the stream by a 4-inch cast-iron water pipe. An auxiliary staff gage is located on the upstream corner of the left abutment of the bridge.

Control.—A low weir 43 feet long was constructed under the bridge between its abutments. It was built of 2-inch plank with its crest carefully planed to grade and its average height was 2.6 feet above the bed of the stream. Near the center of the weir was a notch for the low water flow.

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[1] Determined by engineers of the State of New York Conservation Commission.

A steel plate forms the crest of the notch. The plate is cut to form a rectangular weir 36 inches long and 9 inches deep. In the center of this rectangular weir is a V notch, the top width being 6 inches and the angle 60 degrees.

The timber weir was carried out by the ice May 28, 1914. August 20–22, 1914, a lower concrete weir with a sharp steel crest was constructed. A notch was provided for the low flow similar to the one formerly installed except that the rectangular weir is 0.20 feet deep in place of 9 inches deep.

Discharge measurements.— Made by wading below the weir or from the bridge at high stages. A number of measurements have been made by the volumetric method when the flow was confined to the V notch.

Regulation.— Some diurnal fluctuation is caused by a grist mill a short distance upstream during the spring months.

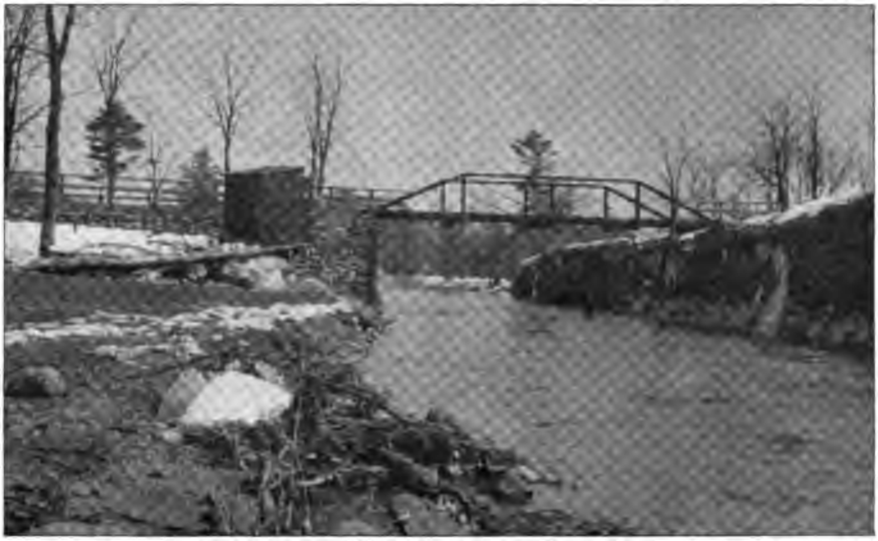
Winter flow.— The crest of the weir was kept free of ice during the winter so that open water conditions prevailed.

Accuracy.— Measurements made at this station check values computed from theoretic formulas, and estimates should be excellent.

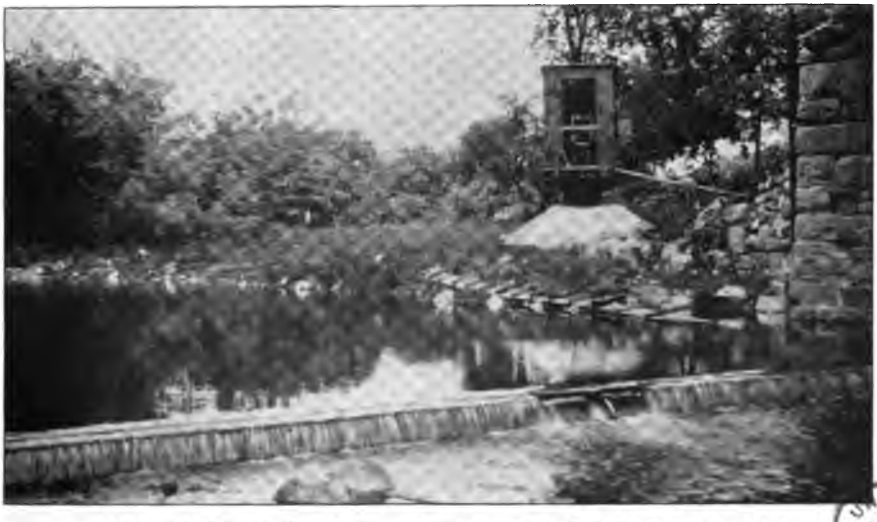
Discharge measurements of Alplaus Kill near Charlton, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
		Feet	*Sec.-ft.*
1913			
Dec. 16[e]	C. S. De Golyer	[a]11.44	18.9
31[e]	R. S. Barnes	[a]11.42	18.7
31[f]	do	[a]11.42	18.8
1914			
Mar. 28	O. W. Hartwell	[b]13.53	863
28	do	[b]13.46	874
28	do	[b]13.33	785
29	do	[b]11.80	390
29	do	[b]11.62	350
29	do	[b]11.58	346
29	do	[b]11.505	342
April 4	C. S. De Golyer	[b]10.70	152
4	do	[b]10.78	170
May 1	O. W. Hartwell	[b]10.04	63
1	do	[b]10.05	65
27[g]	R. S. Barnes	[b]9.58	23.6
27[g]	do	[b]9.56	20.3
June 1[h]	do	[b]9.072	1.56
1[i]	do	[b]9.065	1.67
July 23	C. H. Pierce	[b]8.85	.10
23	do	[b]8.85	.12
Sept. 2[h]	R. S. Barnes	[c]9.55	.55
2[h]	do	[d]9.66	3.83
2[h]	do	[d]9.64	2.16

[a] Gage height on original timber weir.
[b] Gage height with weir in damaged condition.
[c] Gage height on new concrete weir before removing forms.
[d] Gage height on new concrete weir.
[e] Measurement made by wading 150 feet below gage.
[f] Measurement made by wading 100 feet above gage.
[g] Measurement made by wading 200 feet below gage.
[h] Measurement made by wading 300 feet below gage.
[i] Measurement made by wading 300 feet above gage.



Alplaus Kill Near Charlton — April 4, 1914, After Destruction of Timber Weir, 160 Sec. Ft. Flowing



Alplaus Kill near Charlton — Concrete Control Built August, 1914

UNIV. OF MICH.

Daily gage height, in feet, of Alplaus Kill near Charlton, N. Y., for the year ending September 30, 1914

[Mrs. E. B. Litts, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	10.48	10.82	11.50	11.08	11.66	11.03	11.40	10.07	9.09	9.18	8.79	9.56
2.....	10.59	10.62	11.53	10.86	11.65	11.35	12.05	9.88	9.02	9.24	......	9.58
3.....	10.76	10.61	11.46	11.06	11.72	11.37	10.98	9.75	9.00	9.26	8.80	9.56
4.....	10.60	10.95	11.41	10.92	11.61	11.39	10.73	9.68	9.30	9.20	......	9.55
5.....	10.51	10.66	11.36	11.09	11.61	11.44	10.70	10.09	9.35	9.05	......	9.51
6.....	10.50	10.92	11.31	10.91	11.56	11.35	10.63	10.21	9.19	9.20	......	9.50
7.....	10.52	10.72	11.44	11.07	......	11.33	10.39	9.81	9.11	9.42	......	9.48
8.....	10.49	10.80	11.64	11.18	......	11.33	11.39	9.70	9.20	9.60	......	9.50
9.....	10.54	11.62	11.41	10.91	11.38	11.31	11.31	9.66	9.22	9.36	......	9.56
10.....	10.60	11.78	11.41	11.16	......	11.33	10.78	9.63	9.13	9.27	......	9.48
11.....	10.47	11.50	......	11.14	......	11.36	10.64	9.56	9.05	9.20	8.80	9.50
12.....	10.41	11.42	......	11.22	......	11.27	10.96	9.70	8.99	9.13	......	9.46
13.....	10.46	11.36	......	......	......	11.24	10.54	10.73	8.95	9.06	......	9.29
14.....	10.48	11.40	......	......	......	11.28	10.38	10.01	8.93	9.01	......	9.20
15.....	10.51	11.39	......	......	......	11.25	10.39	9.76	8.91	9.06	......	9.18
16.....	10.56	11.37	11.42	......	......	11.36	10.67	9.63	8.89	8.97	......	9.34
17.....	10.48	11.32	11.41	......	......	11.54	10.63	9.56	8.88	9.02	......	9.45
18.....	10.38	11.24	11.38	10.76	11.05	11.98	10.38	9.52	8.87	8.93	8.82	9.46
19.....	10.37	11.22	11.17	10.75	......	11.70	10.33	9.50	8.87	8.88	......	9.45
20.....	......	11.71	11.05	10.76	......	11.73	11.32	9.46	8.93	8.86	......	9.30
21.....	......	11.52	11.03	10.80	......	11.66	10.98	9.44	8.90	8.85	......	9.16
22.....	......	11.45	11.16	10.91	......	11.58	10.26	9.40	8.89	8.84	......	9.10
23.....	10.96	11.42	10.89	10.83	......	11.54	9.98	9.38	8.87	8.85	9.44	9.08
24.....	10.70	11.38	11.00	10.84	11.00	11.48	9.85	9.35	8.87	8.90	9.47	9.25
25.....	10.84	11.36	11.06	10.94	10.98	11.47	9.78	9.33	8.86	8.83	9.41	9.43
26.....	11.32	11.26	11.15	10.99	10.97	11.87	10.87	9.36	8.83	8.86	9.33	9.39
27.....	11.45	11.27	10.91	11.20	10.99	13.20	10.48	9.35	8.82	8.83	9.31	9.33
28.....	11.29	11.10	11.16	11.31	11.00	......	11.12	9.25	8.92	8.80	9.42	9.42
29.....	11.16	11.06	11.28	11.39	......	11.85	10.58	9.19	9.45	8.81	9.51	9.34
30.....	11.16	11.31	11.34	11.47	......	11.38	10.74	9.23	9.31	8.81	9.66	9.25
31.....	10.95	......	11.18	11.55	......	11.55	......	9.18	......	8.81	9.63	......

NOTE.— Gage heights are means of 24 hourly gage heights for each day. Automatic gage not in operation during periods of no gage height. Timber weir carried out by ice March 28, replaced by lower concrete weir August 20–22. Gage heights on new weir beginning August 23.

Daily discharge, in second-feet, of Alplaus Kill near Charlton, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	0.327	2.75	27.3	5.48	48.0	4.91	299	67.	2.0	4.0	0.1	0.600
2.....	.916	1.12	30.8	3.14	46.6	13.3	459	47.	1.0	5.9	.1	.980
3.....	2.21	1.05	22.9	5.24	57.0	14.7	206	36.	.8	6.6	.1	.852
4.....	.980	4.04	18.0	3.74	41.0	16.3	159	30.	8.1	4.6	......	.790
5.....	.460	1.40	14.0	5.60	41.0	20.9	154	69.	10.	1.3	......	.562
6.....	.413	3.74	10.7	3.64	34.4	13.3	143	83.	4.3	4.6	......	.510
7.....	.510	1.88	20.9	5.36	......	11.9	108	41.	2.4	14.	......	.413
8.....	.369	2.57	45.2	6.67	......	11.9	297	31.	4.6	24.	......	.510
9.....	.616	42.4	18.0	3.64	15.5	10.7	278	28.	5.2	11.	......	.852
10.....	.980	66.4	18.0	6.43	......	11.9	168	26.	2.8	7.0	......	.413
11.....	.288	27.3	......	6.19	......	14.0	144	22.	1.3	4.6	.1	.510
12.....	.149	18.9	......	7.15	......	8.5	202	31.	.7	2.8	......	.327
13.....	.251	14.0	......	......	......	7.41	129	1 59.	.5	1.5	......	.072
14.....	.327	17.1	......	......	......	9.0	106	60.	.4	.9	......	.029
15.....	.460	16.3	......	......	......	7.54	108	36.	.3	1.5	......	.023
16.....	.730	14.7	18.9	......	......	14.0	150	26.	.2	.6	......	.106
17.....	.327	11.3	18.0	......	......	33.2	143	22.	.2	1.0	......	.288
18.....	.122	7.41	15.5	2.21	5.13	101.0	106	19.	.1	.4	.1	.327
19.....	.114	7.15	6.55	2.13	......	54.0	99	18.	.1	.2	......	.288
20.....	a.110	55.5	5.13	2.21	......	58.5	281	16.	.4	.1	......	.078

Daily discharge, in second-feet, of Alplaus Kill near Charlton, N. Y. for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
21	a0.110	29.6	4.91	2.57	......	48.0	206	15.	0.2	0.1	......	0.017
22	a.110	21.9	6.43	3.64	......	37.0	90	13.	.2	.1	......	.006
23	4.14	18.9	3.44	2.84	......	32.0	57	12.	.1	.1	.16	.004
24	1.71	15.5	4.58	2.94	4.58	25.1	46	10.	.1	.2	.21	.050
25	2.94	14.0	5.24	3.94	4.36	24.0	40	9.4	.1	.1	.13	.217
26	11.3	8.0	6.31	4.47	4.25	81.3	184	11.	.1	.1	.07	.149
27	21.9	8.5	3.64	6.91	4.47	325.0	120	10.	.1	.1	.06	.099
28	9.5	5.72	6.43	10.7	4.58	780.0	235	6.2	.3	.1	.14	.190
29	6.43	5.24	9.00	16.3	......	408.0	135	4.3	15.	.1	.36	.106
30	6.43	10.7	12.6	24.0	......	294.0	161	5.5	8.5	.1	1.24	.050
31	4.04	......	6.67	33.2	......	335.0	......	4.0	......	.1	1.03	......

a Estimated.

NOTE.— Four rating tables used as follows: Timber weir in good condition October 1 to March 27, inclusive; timber weir as damaged by ice, March 29 to August 19, inclusive; concrete weir with concrete forms, August 23 to September 1; concrete weir in final condition September 2 to 30.

Monthly discharge of Alplaus Kill near Charlton, N. Y., for the year ending September 30, 1914
[Drainage area, 24.9 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	21.9	a0.110	2.56	0.103	0.11	A
November	66.4	1.05	15.2	.613	.68	A
December	45.2	3.44	14.5	.582	.67	A
January	33.2	....	6.46	.259	.30	B
February	57.0	....	16.5	.663	.69	B
March	780	4.91	91.2	3.66	4.22	A
April	459	40.0	167.0	6.71	7.49	A
May	159.	4.0	31.2	1.25	1.44	A
June	15.	.1	2.3	.092	.10	B
July	24.	.1	3.2	.129	.15	B
August	1.24	0	.132	.005	.01	C
September	.980	.004	.314	.013	.01	A
The year	780.	0	29.1	1.17	15.87	......

a Estimated.

NOTE.— Mean discharge for periods where no daily values are available is estimated.

KINDERHOOK CREEK AT ROSSMAN, N. Y.

Location.— On highway bridge at Rossman, N. Y., 3½ miles above the confluence of the creek, through Stockport creek, with Hudson river, 1 mile above the mouth of Claverack creek, which it joins to form Stockport creek, and 9 miles by road above the village of Hudson.

Records available.— March 17, 1906, to May 1, 1914.

Drainage area.— 331 square miles. (From U. S. Geological Survey water supply papers.)

Gage.— Tape and weight type attached to highway bridge; read twice daily; datum unchanged.

Control.— Rock with some soil on sides.

Discharge measurements.— Made from single span steel highway bridge.

Regulation.— Low-water flow practically controlled by several power plants and paper mills above the station. Several small lakes also tend to affect low-water flow for short periods.

Winter flow.— Discharge relation affected by ice. Gage observations suspended during frozen periods.

Special studies.— A portable automatic gage was set up near the observer's gage and a continuous automatic record of gage heights was obtained from August 3 to August 12, and November 30 to December 5, 1912, and from May 31 to June 10, 1913. The true mean daily discharge was determined from hourly gage heights from the continuous record and was compared with the discharge obtained from semi-daily observations. It appeared that daily discharges computed from semi-daily observations were fairly good for discharges above 100 second-feet. The mean daily gage heights obtained from semi-daily observations are being published, together with estimates for the periods when the daily discharge is above 100 second-feet.

As a result of these studies the station was discontinued May 1, 1914, because funds are not available to operate a permanent automatic gage at this point.

Accuracy.— Open-channel discharge rating curve well defined. Accuracy of estimate depends entirely on accuracy of mean daily gage heights. See Special Study.

No discharge measurements were made during 1914.

Daily gage height, in feet, of Kinderhook Creek at Rossman, N. Y., for the year ending September 30, 1914

[Lester Allen, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	26.14	27.02	27.30	27.22	28.5	......	29.9	28.6
2	26.32	26.92	27.32	27.16	28.3	......	31.0	......
3	26.26	26.82	27.23	26.92	28.0	......	30.2	......
4	26.02	26.70	27.27	27.04	28.0	......	29.5	......
5	26.10	26.70	27.26	27.25	28.1	......	28.9	......
6	26.52	26.85	27.25	27.15	27.7	......	28.6	......
7	26.20	26.62	27.08	27.28	27.6	......	28.6	......
8	26.48	26.71	27.32	27.28	27.45	27.7	29.2	......
9	26.10	26.48	27.27	27.27	27.5	27.55	32.1	......
10	26.23	26.94	27.26	26.98	27.6	27.48	30.3	......
11	26.01	27.48	27.23	27.28	27.27	27.32	29.4	......
12	26.32	27.38	27.06	27.14	27.38	27.02	29.3	......
13	26.08	27.20	27.20	......	27.12	27.08	29.2	......
14	26.25	27.11	27.31	......	27.05	26.82	28.7	......
15	26.44	27.38	27.49	......	27.12	26.98	28.5	......
16	26.80	27.15	27.55	......	27.09	27.02	28.7	......
17	26.58	27.16	27.28	......	......	28.35	28.8	......
18	26.44	27.28	27.26	......	......	29.9	28.6	......
19	26.10	27.18	27.18	......	......	28.6	28.7	......
20	26.51	27.28	27.05	......	......	28.1	29.7	......
21	26.54	27.55	27.20	......	......	27.75	31.6	......
22	26.62	27.36	27.21	......	......	27.75	29.9	......
23	26.68	27.25	27.05	......	......	27.6	29.1	......
24	26.52	27.27	27.19	......	......	28.0	28.8	......
25	26.66	27.29	27.22	......	......	28.8	28.5	......
26	26.82	27.27	27.22	......	......	31.6	28.9	......
27	28.0	27.22	27.31	......	......	32.6	29.1	......
28	27.65	27.28	27.30	27.8	......	33.3	28.6	......
29	27.47	27.23	27.08	28.5	......	31.3	28.5	......
30	27.32	27.30	27.05	28.7	......	30.2	28.7	......
31	27.22	......	27.02	28.5	......	29.7	......	......

NOTE.— Discharge relation affected by ice January 13 to 27, and February 17 to March 7. Station discontinued May 2, 1914.

Daily discharge, in second-feet, of Kinderhook Creek at Rossman, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
1	......	233	359	320	1,250	......	2,860	1,340
2	......	195	370	292	1,070	......	4,510	......
3	......	160	325	195	826	......	3,280	......
4	......	122	344	241	826	......	2,340	......
5	......	122	339	334	906	......	1,640	......
6	......	170	334	288	602	......	1,340	......
7	......	100	257	349	534	......	1,340	......
8	......	125	370	349	441	602	1,980	......
9	......	......	344	344	470	502	6,400	......
10	......	202	339	217	534	458	3,430	......
11	......	458	325	349	344	370	2,210	......
12	......	401	249	283	401	233	2,090	......
13	......	310	310	......	274	257	1,980	......
14	......	270	364	......	245	160	1,440	......
15	......	401	464	......	274	217	1,250	......
16	153	288	502	......	261	233	1,440	......
17	......	280	349	......	......	1,120	1,540	......
18	......	349	339	......	......	2,860	1,340	......
19	......	301	301	......	......	1,340	1,440	......
20	......	349	245	......	......	906	2,590	......
21	......	502	310	......	......	638	5,510	......
22	100	391	315	......	......	638	2,860	......
23	116	334	245	......	......	534	1,860	......
24	......	344	306	......	......	826	1,540	......
25	111	354	320	......	......	1,540	1,250	......
26	160	344	320	......	......	5,510	1,640	......
27	826	320	364	......	......	7,300	1,860	......
28	568	349	359	673	......	8,600	1,340	......
29	453	325	257	1,250	......	5,000	1,250	......
30	370	359	245	1,440	......	3,280	1,440	......
31	320	......	233	1,250	......	2,590	......	......

NOTE.— Daily discharge not given when it comes below 100 second-feet. See " Special study " in station description.

Monthly discharge of Kinderhook Creek at Rossman, N. Y., for the year ending September 30, 1914
[Drainage area, 331 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
November	502	....	284	0.858	0.96	C
December	502	233	326	.985	1.14	C
January	1,440	....	394	1.19	1.37	C
February	1,250	....	405	1.22	1.27	C
March	8,600	160	1,670	5.05	5.82	C
April	6,400	1,250	2,230	6.74	7.52	B

NOTE.— Mean discharge estimated by comparison with nearby streams as follows: January 13 to 27, 269 second-feet; February 17 to 28, 173 second-feet; March 1 to 7, 853 second-feet.

DELAWARE RIVER DRAINAGE BASIN

General Features

The headquarters of Delaware river are found in Delaware, Greene, and Schoharies counties, N. Y. The East branch, which may be considered the main stream, rises at Grand Gorge in northeastern Delaware county; the West branch has its source in a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above sea level; the two streams unite at Hancock. From this junction point the river flows southeastward until it reaches Port Jervis, where it turns to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk range until it passes through the water gap, from which point it flows in an irregular southerly direction to Trenton. Below Trenton its course is in general southwestward to Delaware bay. Between Hancock and Port Jervis it forms the dividing line between New York and Pennsylvania: south of Port Jervis it separates Pennsylvania from New Jersey and, for a few miles, Delaware from New Jersey.

The drainage area of Delaware river, measured at Philadelphia and including that of Schuylkill river, is about 10,100 square miles, of which about 2,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Neversink rivers and Callicoon creek from New York; Lackawaxen, Lehigh, and Schuylkill rivers and numerous creeks from Pennsylvania; and Rancocas creek, Musconetcong river, and Maurice river from New Jersey.

EAST BRANCH OF DELAWARE RIVER AT FISH EDDY, N. Y.

Location.—At the highway bridge near New York, Ontario and Western Railway station at Fish Eddy, 5½ miles above the confluence of the East and West branches of the Delaware river at Hancock.

Records available.— November 19, 1912, to September 30, 1914.

Drainage area.— 790 square miles. (Measured on Post Route Map.)

Gage.— Vertical staff, in two sections.

Control.— Coarse gravel; apparently permanent.

Discharge measurements.—At low stages made by wading; at high stages from the highway bridge.

Winter flow.— Discharge relation seriously affected by ice. Frequent discharge measurements are necessary to obtain reliable records for frozen periods.

Accuracy.— Discharge rating curve fairly well defined.

Co-operation.— Established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of East Branch of Delaware River at Fish Eddy, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 28	R. S. Barnes	4.37	1,820
1914			
Jan. 5*a*	C. S. De Golyer	3.01	601
5	do	3.02	623
20*b*	do	3.86	399
29*b*	do	4.26	816
Feb. 2	do	5.32	2,410
19*c*	R. S. Barnes	5.51	618
Mar. 20*c*	do	6.11	760
April 2	do	9.40	10,800
21	C. C. Covert	9.70	11,100
22	do	7.91	7,360
Sept. 21*d*	C. S. De Golyer	1.90	163

a Measurement made by wading 200 feet below gage.
b Backwater from ice. Measurement made through ice 400 feet below gage.
c Backwater from ice. Measurement made through ice about one-quarter mile below gage.
d Measurement made by wading 300 feet below gage.

Daily gage height, in feet, of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending September 30, 1914

[John Fininegan, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	2.4	3.5	4.4	3.1	......	4.7	9.8	......	2.6	2.25	2.15	2.7
2	2.85	3.45	4.4	2.7	5.3	4.6	10.8	......	2.5	2.5	2.05	2.8
3	2.85	3.45	4.5	3.05	5.1	4.6	9.8	......	2.5	2.45	2.05	2.75
4	2.55	3.4	4.4	3.2	4.8	4.5	12.5	......	2.8	2.3	2.0	2.7
5	2.5	3.4	4.3	3.0	4.8	4.5	12.6	......	3.3	2.2	1.95	2.5
6	2.4	3.35	4.3	2.6	4.8	4.5	11.7	......	2.8	2.35	1.95	2.45
7	2.35	3.35	4.6	2.6	4.6	4.6	10.7	......	2.6	2.55	1.9	2.4
8	2.35	3.4	4.5	2.85	4.5	4.6	10.0	......	3.25	2.55	1.9	2.3
9	2.3	8.8	4.8	2.8	4.4	4.6	9.8	......	3.35	2.55	1.9	2.25
10	2.25	10.1	5.0	2.65	3.3	4.5	9.5	5.1	2.9	2.65	1.95	2.2
11	2.2	7.4	......	2.6	4.0	4.5	9.2	4.9	2.7	2.55	1.95	2.15
12	2.15	6.8	......	2.7	4.5	4.4	9.1	4.8	2.6	3.0	2.6	2.1
13	2.15	6.2	......	3.8	5.2	4.4	9.1	4.7	2.45	2.6	2.5	2.05
14	2.05	5.5	......	4.0	6.5	4.4	9.0	5.0	2.4	2.4	2.3	2.05
15	2.15	5.0	......	4.2	6.2	4.4	8.9	6.2	2.3	2.45	2.15	2.0
16	2.3	4.9	......	4.3	5.8	4.3	9.0	5.8	2.35	2.45	2.05	1.95
17	2.35	4.8	......	......	5.7	4.8	8.9	5.1	2.3	2.4	2.0	1.95
18	2.3	4.8	......	......	5.7	4.9	8.9	4.4	2.25	2.55	2.05	1.95
19	2.3	4.7	......	......	5.6	5.5	8.9	3.9	2.2	2.5	2.45	1.95
20	3.6	4.7	......	3.8	5.5	6.3	10.4	3.8	2.3	2.55	3.25	1.95
21	4.7	4.6	......	3.7	5.3	7.1	10.2	3.7	2.3	2.5	4.7	1.9
22	4.6	4.6	......	3.6	5.3	6.1	8.7	3.6	2.3	2.5	4.7	1.95
23	4.3	4.6	......	3.5	5.2	5.4	7.0	3.5	2.25	2.4	3.7	1.8
24	......	4.8	......	3.45	5.0	5.4	6.8	3.3	2.35	2.5	3.4	1.85
25	......	5.0	......	3.4	4.9	5.6	6.6	3.2	2.4	2.5	3.15	1.8
26	......	4.8	......	3.35	4.9	6.3	......	3.2	2.25	2.35	2.9	1.8
27	5.1	4.6	......	3.35	4.8	10.2	......	3.1	2.15	2.25	2.75	1.9
28	4.3	4.5	......	3.25	4.8	14.8	......	3.05	2.25	2.3	2.75	1.85
29	3.8	4.4	......	4.2	......	13.2	......	3.0	2.3	2.3	2.8	1.8
30	3.6	4.4	......	5.2	......	10.0	......	2.95	2.3	2.25	3.0	1.8
31	3.6	......	......	......	......	8.8	......	2.9	......	2.25	2.8	......

NOTE.— Discharge relation affected by ice January 11 to March 26.

Daily discharge, in second-feet, of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	330	950	1,850	670	2,890	......	11,500	......	412	274	239	456
2	530	910	1,850	456	2,460	......	14,400	......	370	370	206	504
3	530	910	1,960	640	2,080	......	11,500	......	370	350	206	480
4	391	870	1,850	730	1,740	......	19,600	......	504	292	190	456
5	370	870	1,740	610	1,850	......	20,000	......	800	256	176	370
6	330	835	1,740	412	1,630	......	17,100	......	504	311	176	350
7	311	835	2,080	412	1,220	......	14,100	......	412	391	161	330
8	311	870	1,960	530	1,040	......	12,000	......	765	391	161	292
9	292	10,200	2,330	504	870	......	11,500	......	835	391	161	274
10	274	13,400	2,600	434	730	......	10,800	2,640	556	434	176	256
11	256	6,950	......	330	583	......	10,100	2,390	456	391	176	239
12	239	5,650	......	292	434	......	9,920	2,270	412	610	412	222
13	239	4,500	......	292	456	......	9,920	2,150	350	412	370	206
14	206	3,340	......	256	870	......	9,700	2,510	330	330	292	206
15	239	2,600	......	350	835	......	9,480	4,200	292	350	239	190
16	292	2,470	......	504	800	......	9,700	3,600	311	350	206	176
17	311	2,330	......	556	765	......	9,480	2,640	292	330	190	176
18	292	2,330	......	530	730	......	9,480	1,810	274	391	206	176
19	292	2,200	......	456	670	434	9,480	1,290	256	370	350	176
20	1,040	2,200	......	391	583	870	13,200	1,200	292	391	765	176
21	2,200	2,080	......	330	504	1,630	12,600	1,110	292	370	2,150	161
22	2,080	2,080	......	311	480	800	9,040	1,030	292	370	2,150	176
23	1,740	2,080	......	256	434	391	5,600	950	274	330	1,110	134
24	1,220	2,330	......	239	350	370	5,220	800	311	370	870	148
25	1,130	2,600	......	222	330	480	4,860	730	330	370	700	134
26	1,320	2,330	......	222	330	2,460	......	730	274	311	556	134
27	2,740	2,080	......	239	311	12,600	......	670	239	274	480	161
28	1,740	1,960	......	239	274	27,900	......	640	274	292	480	148
29	1,220	1,850	......	800	......	22,000	......	610	292	292	504	134
30	1,040	1,850	......	2,200	......	12,000	......	583	292	274	610	134
31	1,040	......	......	3,660	......	9,260	......	556	......	274	504	......

NOTE.— Daily discharge values given during the period January 11 to March 26, inclusive, are only approximate. Daily discharge for periods of open water determined from a well-defined rating curve. New rating table used beginning March 27.

Monthly discharge of East Branch of Delaware River at Fish Eddy, N. Y., for the year ending September 30, 1914

[Drainage area, 790 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	2,740	206	792	1.00	1.15	C
November	13,400	835	2,880	3.65	4.07	D
December	....	....	1,730	2.19	2.52	D
January	3,660	222	583	.738	.85	B
February	2,890	274	937	1.19	1.24	C
March	27,900	370	3,210	4.06	4.68	D
April	20,000	....	10,500	13.30	14.83	C
May	....	556	1,830	2.32	2.68	B
June	835	239	389	.492	.55	B
July	610	256	352	.446	.51	B
August	2,150	161	489	.619	.72	B
September	504	134	239	.303	.34	B
The year	27,900	134	1,980	2.51	34.14	.....

NOTE.— Mean discharge estimated by comparison with West Branch of Delaware at Hale Eddy and Delaware at Port Jervis as follows: December 11 to 31, 1,600 second-feet; March 1 to 18, 462 second-feet; April 26 to May 9, 5,010 second-feet.

DELAWARE RIVER AT PORT JERVIS, N. Y.

Location.—At the toll bridge at Port Jervis, 6 miles below the mouth of Mongaup river and 1 mile above the mouth of Neversink river, both entering from the north.

Records available.— October 12, 1904, to September 30, 1914.

Drainage area.— 3,250 square miles. (From U. S. Geological Survey water supply papers.)

Gage.— Standard chain, fastened to downstream side of bridge; read once daily. The elevation of the datum of the gage is 414.89 feet above the mean seal level.

On June 20, 1914, the chain gage was replaced by a vertical staff gage attached to the wall about 30 feet downstream from the left abutment of the bridge. A sloping staff gage extends from the foot of the vertical gage (gage height 7.6) to a point below low water (gage height 0.5).

Control.— Composed of gravel; probably permanent.

Discharge measurements.— Made from the highway bridge, except at low stages, when the left channel is measured by wading.

Winter flow.— Discharge relation is not greatly affected by ice, except during very cold winters. Ice jams sometimes occur at this station and the left channel is particularly subject to backwater from ice.

Accuracy.— Conditions of flow at this point are constant and a good discharge rating curve has been developed for all stages. Careful comparison of records at this station with those obtained at Riegelsville and the two Hancock stations indicate that all the discharge data are reliable.

Co-operation.— Gage heights furnished by the United States Weather Bureau. Discharge data obtained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Delaware River at Port Jervis, N. Y., during the year ending September 30, 1914

DATE		Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Sept. 19*a*......	C. S. De Golyer..................................	1.40	550

a Measurement made by wading 500 feet below gage.

Daily gage height, in feet, of Delaware River at Port Jervis, N. Y., for year ending September 30, 1914

[Jacob Miller, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	1.4	2.6	3.3	3.1	5.8	......	8.8	5.5	2.5	2.25	1.95	2.3
2.....	1.8	2.3	3.2	2.9	6.5	......	8.7	5.0	2.4	2.25	1.9	2.2
3.....	2.2	2.1	3.1	2.8	5.3	......	9.3	4.7	2.3	2.25	1.8	2.15
4.....	1.6	2.1	3.1	2.7	5.0	......	7.8	4.5	2.3	2.15	1.7	2.2
5.....	1.4	2.1	3.1	2.6	4.9	......	7.0	4.2	3.1	2.05	1.65	2.2
6.....	1.6	2.1	3.0	2.6	4.8	......	6.5	4.9	3.0	2.0	1.49	2.1
7.....	1.6	2.1	3.0	2.6	4.2	......	5.8	5.9	2.8	2.15	1.5	1.95
8.....	1.6	2.1	3.9	2.4	4.2	......	6.0	5.2	2.6	2.1	1.5	1.9
9.....	1.6	2.8	3.9	2.7	4.1	....	11.0	5.0	3.1	2.35	1.46	1.8
10.....	1.6	9.7	3.7	2.4	4.1	....	9.0	4.9	2.8	2.45	1.45	1.75

Daily gage height, in feet, of Delaware river at Port Jervis N. Y., for the year ending September 30, 1914.—Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
11.....	1.5	7.3	3.7	2.3	4.1	......	6.7	4.5	2.8	3.0	1.48	1.7
12.....	1.6	6.1	3.4	2.1	2.8	......	6.7	4.6	2.5	3.5	1.8	1.55
13.....	1.8	5.3	3.4	2.1	2.3	......	6.6	6.5	2.3	3.3	2.05	1.55
14.....	1.7	4.7	3.3	......	2.3	......	6.0	6.5	2.2	3.0	2.05	1.48
15.....	1.5	4.6	3.4	......	......	......	5.6	6.1	2.1	2.7	1.95	1.5
16.....	1.5	4.3	3.3	......	......	......	5.6	5.9	2.0	2.6	1.8	1.55
17.....	1.5	4.1	3.3	3.2	......	......	6.0	5.4	2.0	2.4	1.65	1.5
18.....	1.5	3.8	3.2	3.1	......	......	5.8	5.0	2.0	2.55	1.65	1.39
19.....	1.5	4.2	3.2	......	......	......	5.4	4.5	1.9	2.9	1.7	1.33
20.....	1.6	4.0	3.1	......	......	......	5.5	4.4	1.8	2.7	1.95	1.28
21.....	2.5	3.9	3.1	......	......	......	9.1	4.4	1.9	2.5	2.8	1.24
22.....	4.0	3.8	2.9	......	......	......	8.4	4.1	1.8	2.2	4.1	1.15
23.....	3.4	3.5	2.9	......	......	......	7.9	3.4	1.8	2.1	3.1	1.24
24.....	3.4	3.4	3.1	......	......	4.9	6.0	3.2	2.5	2.15	3.0	1.36
25.....	3.6	3.2	3.3	......	......	4.6	5.7	3.1	2.2	2.1	2.85	1.21
26.....	3.6	3.1	3.3	......	......	4.1	5.7	2.9	2.0	2.2	2.6	1.23
27.....	4.0	3.1	3.1	......	......	7.7	7.2	2.9	2.0	2.15	2.7	1.22
28.....	3.4	3.1	3.2	......	......	16.0	6.4	3.1	1.9	2.05	2.25	1.17
29.....	3.3	3.3	3.2	......	......	14.2	5.9	2.8	1.9	2.15	2.15	1.15
30.....	3.0	3.4	2.8	......	......	9.2	5.6	2.4	2.1	2.2	2.1	1.20
31.....	2.8	......	2.7	......	......	9.2	......	2.6	......	2.05	2.25	......

NOTE.— Discharge relation affected by ice January 14 to 31, and February 15 to March 23. Gage readings suspended during these periods.

Daily discharge, in second-feet, of Delaware River at Port Jervis, N. Y., for year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	600	2,230	3,830	3,320	13,500	......	33,500	12,100	2,040	1,610	1,180	1,690
2.....	990	1,690	3,570	2,860	17,400	......	32,700	9,780	1,860	1,610	1,110	1,530
3.....	1,530	1,380	3,320	2,640	11,100	......	37,300	8,520	1,690	1,610	990	1,460
4.....	780	1,380	3,320	2,430	9,780	......	26,000	7,730	1,690	1,460	880	1,530
5.....	600	1,380	3,320	2,230	9,350	......	20,500	6,620	3,320	1,310	830	1,530
6.....	780	1,380	3,080	2,230	8,930	......	17,400	9,350	3,080	1,240	676	1,380
7.....	780	1,380	3,080	2,230	6,620	......	13,500	14,100	2,640	1,460	685	1,180
8.....	780	1,380	5,600	1,860	6,620	......	14,600	10,700	2,230	1,380	685	1,110
9.....	780	2,640	5,600	2,430	6,270	......	50,900	9,780	3,320	1,780	651	990
10.....	780	40,400	4,970	1,860	6,270	......	35,000	9,350	2,640	1,950	642	935
11.....	685	22,500	4,970	1,690	6,270	......	18,600	7,730	2,640	3,080	668	880
12.....	780	15,100	4,100	1,380	2,640	......	18,600	8,120	2,040	4,380	990	732
13.....	990	11,100	4,100	1,380	1,690	......	18,000	17,400	1,690	3,830	1,310	732
14.....	880	8,520	3,830	......	1,690	......	14,600	17,400	1,530	3,080	1,310	668
15.....	685	8,120	4,100	......	......	......	12,500	15,100	1,380	2,430	1,180	685
16.....	685	6,980	3,830	......	......	......	12,500	14,100	1,240	2,230	990	732
17.....	685	6,270	3,830	......	......	......	14,600	11,600	1,240	1,860	830	635
18.....	685	5,280	3,570	......	......	......	13,500	9,780	1,240	2,140	830	592
19.....	685	6,620	3,570	......	......	......	11,600	7,730	1,110	2,860	880	548
20.....	780	5,930	3,320	......	......	......	12,100	7,350	990	2,430	1,180	511
21.....	2,040	5,600	3,320	......	......	......	35,800	7,350	1,110	2,040	2,640	483
22.....	5,930	5,280	2,860	......	......	......	30,500	6,270	990	1,530	6,270	422
23.....	4,100	4,380	2,860	......	......	......	26,800	4,100	990	1,380	3,320	483
24.....	4,100	4,100	3,320	......	......	9,350	14,600	3,570	2,040	1,460	3,080	570
25.....	4,670	3,570	3,830	......	......	8,120	13,000	3,320	1,530	1,380	2,750	462
26.....	4,670	3,320	3,830	......	......	6,270	13,000	2,860	1,240	1,530	2,230	476
27.....	5,930	3,320	3,320	......	......	25,300	21,800	2,860	1,240	1,460	2,430	469
28.....	4,100	3,320	3,570	......	......	92,700	16,800	3,320	1,110	1,310	1,610	436
29.....	3,830	3,830	3,570	......	......	77,200	14,100	2,640	1,110	1,460	1,460	422
30.....	3,030	4,100	2,640	......	......	36,500	12,500	1,860	1,380	1,530	1,380	455
31.....	2,640	......	2,430	......	......	36,500	......	2,230	......	1,310	1,610	......

NOTE.— Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of Delaware River at Port Jervis, N. Y., for the year ending September 30, 1914
[Drainage area, 3,250 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	5,930	600	1,970	0.606	0.70	B
November	40,400	1,380	5,750	1.77	1.98	B
December	5,600	2,430	3,690	1.14	1.31	B
January	....	....	2,820	.868	1.00	C
February	17,400	....	5,860	1.80	1.87	C
March	92,700	....	13,100	4.03	4.65	C
April	50,900	11,600	20,900	6.43	7.17	A
May	17,400	1,860	8,220	2.53	2.92	A
June	3,320	990	1,740	.536	.60	B
July	4,380	1,240	1,940	.597	.69	B
August	6,270	642	1,530	.471	.54	B
September	1,690	422	826	.254	.28	B
The year	92,700	422	5,680	1.75	23.71	.....

NOTE.— Mean discharge estimated by comparison with the flow of the east and west branches of the Delaware as follows: January 14 to 31, 3,250 second-feet; February 15 to 28, 4,000 second-feet; March 1 to 23, 5,000 second-feet.

BEAVER KILL AT COOKS FALLS, N. Y.

Location.— At the covered highway bridge in Cooks Falls, N. Y.

Records available.— July 25, 1913, to September 30, 1914.

Drainage area.— Not measured.

Gage.— Vertical staff in two sections graduated from 0.0 to 16.0.

Control.— Coarse gravel and boulders with left bank of solid rock; probably permanent.

Discharge measurements.— Made from highway bridge during high water and by wading during low water.

Winter flow.— Discharge relation affected by ice.

Co-operation.— Established and maintained by United States Geological Survey in co-operation with the New York State Engineer and Surveyor.

Discharge measurements of Beaver Kill at Cooks Falls, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
April 2	R. S. Barnes	7.30	3,930
Sept. 21*a*	C. S. De Golyer	1.00	62

a Measurement made by wading 200 feet below gage.

Daily gage height, in feet, of Beaver Kill at Cooks Falls, N. Y., year ending September 30, 1914
[J. L. Rosa, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	1.30	2.15	2.75	1.60	......	5.85	3.80	1.58	1.45	1.28	1.72
2	2.32	1.95	2.62	1.75	......	7.35	3.45	1.48	1.85	1.18	1.60
3	2.15	2.10	2.55	1.95	......	6.00	3.28	1.45	1.70	1.12	1.68
4	1.82	2.10	2.48	2.05	......	5.05	3.12	2.05	1.38	1.12	1.65
5	1.58	2.00	2.40	......	......	4.55	4.15	2.20	1.28	1.00	1.58
6	1.50	2.00	2.30	......	......	4.15	4.80	1.92	1.60	1.02	1.42
7	1.50	2.15	3.25	......	......	4.15	3.95	1.75	1.70	1.02	1.38
8	1.58	2.10	4.65	......	......	7.65	3.58	2.40	1.70	1.02	1.32
9	1.88	9.05	3.50	......	......	8.45	3.45	2.25	1.82	.92	1.28
10	1.68	7.10	3.12	......	......	6.05	3.25	1.92	1.78	1.50	1.18
11	1.65	5.05	2.95	......	......	5.45	3.12	1.75	1.72	2.40	1.15
12	1.75	4.25	2.80	......	......	5.80	3.60	1.55	2.00	1.72	1.05
13	1.80	3.98	2.70	......	......	5.40	4.45	1.52	1.72	1.48	1.00
14	1.55	3.70	2.80	......	......	4.85	3.70	1.42	1.50	1.40	.98
15	1.45	3.50	2.80	......	......	4.85	3.35	1.32	1.60	1.42	.95
16	1.45	3.15	2.70	......	......	5.05	3.15	1.32	1.55	1.22	.90
17	1.45	3.05	2.75	......	......	5.10	3.05	1.30	1.48	1.42	.92
18	1.75	3.05	2.75	......	......	4.95	2.95	1.25	2.60	1.45	.92
19	1.85	3.25	2.52	......	......	5.30	2.78	1.32	1.90	2.65	.82
20	4.25	3.45	1.95	......	......	8.05	2.50	1.50	1.68	2.48	.95
21	6.15	3.15	2.25	......	......	6.85	2.32	1.32	1.50	4.20	.90
22	3.90	2.98	2.25	......	......	5.40	2.25	1.52	1.55	3.50	.90
23	2.75	2.95	2.30	......	......	4.75	2.22	1.42	1.42	2.70	.95
24	3.65	2.80	2.50	......	......	4.25	2.18	1.75	1.55	2.38	1.10
25	5.70	2.65	2.52	......	3.45	4.10	2.12	1.55	1.52	2.22	1.00
26	4.90	2.48	2.55	......	4.70	5.60	2.00	1.38	1.38	1.98	.98
27	4.10	2.35	2.05	......	7.25	4.80	2.08	1.32	1.40	1.88	1.00
28	3.60	2.30	1.95	......	10.40	4.30	2.05	1.45	1.42	1.80	.95
29	3.15	2.85	1.75	......	8.00	4.10	1.92	1.50	1.38	1.80	.95
30	2.90	2.95	1.65	......	6.65	4.15	1.82	1.42	1.40	2.02	1.00
31	2.50	......	1.50	......	6.20	......	1.68	......	1.38	1.82	......

NOTE.— Discharge relation affected by ice from about January 1 to March 24, inclusive.

WEST BRANCH OF DELAWARE RIVER AT HALE EDDY, N. Y.

Location.— At high bridge, 400 feet west of the Erie Railroad station in the village of Hale Eddy, 8 miles above junction with east branch of Hancock, 8 miles below the power dam of the Deposit Electric Co.

Records available.— November 15, 1912, to September 30, 1914.

Drainage area.— 611 square miles. (Measured on Post Route Map.)

Gage.— A vertical staff gage in four sections.

Control.— Coarse gravel and boulders, about three-fourths mile below the gage and apparently permanent. Between the control and the gage there is low land behind the left bank which is overflowed by extreme high water.

Discharge measurements.— Made by wading across three channels above the bridge or one below in low water. High-water measurements made from highway bridge.

Winter flow.— Discharge relation seriously affected by ice. Frequent discharge measurements are necessary to obtain the discharge during this period.

Floods.— The observer states that on October 10, 1893, the water reached an elevation indicated by a spike in a tree near the gage. This spike is at gage height 20.3.

Accuracy.— Discharge rating curve fairly well defined. Good conditions for meter measurements.

Co-operation.— Established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of West Branch of Delaware River at Hale Eddy, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Jan. 6*a*......	C. S. De Golyer..................................	4.85	394
21*a*......	do	4.97	248
30*b*......	do	6.39	1,510
Feb. 2......	do	5.34	2,300
19*c*......	R. S. Barnes..................................	4.94	644
Mar. 21*d*......	do	5.30	304
April 1......	do	8.26	5,820
22......	C. C. Covert..................................	7.91	5,450
Sept. 22*e*......	C. S. De Golyer..................................	1.78	99
22*f*......	do	1.78	102

a Backwater from ice. Measurement made through ice about 600 feet above gage.
b Backwater from ice. Measurement made through ice about ½ mile below gage.
c Backwater from ice. Measurement made through ice about 500 feet below gage.
d Backwater from ice. Measurement made through ice about 800 feet below gage.
e Measurement made by wading about ¾ mile below gage.
f Measurement made by wading 300 feet below gage.

Daily gage height, in feet, of West Branch of Delaware River at Hale Eddy, N. Y., for year ending September 30, 1914

[William Seeley, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	1.45	2.15	3.3	2.55	7.4	4.1	8.0	5.0	2.3	2.1	2.1	2.7
2.....	1.5	2.2	3.2	4.6	5.4	4.4	8.8	4.6	2.5	2.1	1.9	2.6
3.....	1.5	2.05	3.1	4.9	4.7	4.4	7.8	4.3	2.7	2.1	1.8	2.95
4.....	1.5	2.0	3.0	4.8	4.8	4.4	6.5	4.1	2.7	2.1	1.8	2.95
5.....	1.5	2.0	3.1	4.0	4.8	4.6	6.1	4.9	2.7	2.0	1.8	2.65
6.....	1.5	1.95	2.95	4.6	3.4	4.6	5.6	6.3	2.55	2.2	1.6	2.5
7.....	1.48	2.0	3.2	4.2	3.8	4.6	5.4	5.3	2.65	2.5	1.6	2.5
8.....	1.48	1.95	4.3	3.6	3.4	4.4	7.8	4.8	2.6	2.7	1.7	2.3
9.....	1.4	4.6	4.2	3.6	2.65	4.4	11.2	4.6	3.2	2.85	2.0	2.3
10.....	1.42	7.6	3.5	3.4	2.6	4.2	8.2	4.4	2.8	3.6	2.1	2.1
11.....	1.38	5.6	3.6	5.0	2.8	4.2	6.9	4.0	2.7	3.7	2.0	2.1
12.....	1.3	4.8	3.4	5.3	2.35	3.8	6.6	4.7	2.35	3.6	1.9	2.05
13.....	1.4	4.6	3.4	5.1	2.6	3.8	6.0	7.1	2.2	3.2	1.8	2.0
14.....	1.4	4.6	3.5	5.2	3.6	3.7	5.4	6.2	2.05	3.0	1.8	1.95
15.....	1.45	4.4	3.5	5.0	4.2	3.4	5.2	5.6	2.0	2.9	1.8	1.9
16.....	1.45	4.0	3.4	5.2	4.8	3.7	5.7	5.4	2.15	2.7	1.8	1.85
17.....	1.4	3.9	3.2	5.0	4.8	5.0	5.6	4.7	2.0	2.55	1.8	1.9
18.....	1.35	3.9	3.2	5.0	4.8	6.6	5.3	4.3	1.9	2.7	1.9	1.75
19.....	1.4	3.8	3.1	4.9	5.0	6.4	5.2	4.0	1.8	3.1	3.4	1.9
20.....	2.5	4.0	2.6	4.8	5.0	5.6	8.7	3.8	2.0	2.7	3.2	1.8
21.....	4.0	4.2	2.85	4.9	4.8	5.4	9.8	3.6	2.0	2.5	4.1	1.8
22.....	3.8	3.9	2.75	4.6	4.8	5.2	7.8	3.4	2.1	2.5	4.9	1.8
23.....	2.7	3.8	2.75	4.6	4.7	4.9	6.4	3.2	1.95	2.6	4.0	1.75
24.....	2.5	3.7	3.4	4.7	4.6	4.6	5.6	3.0	1.95	2.8	3.5	1.7
25.....	2.65	3.6	3.2	4.8	4.5	4.4	5.2	2.9	2.0	2.7	3.4	1.8
26.....	2.6	3.6	3.2	5.0	4.3	7.4	5.6	2.7	1.8	2.5	3.1	1.65
27.....	2.8	3.5	2.75	4.9	4.2	11.4	5.9	2.75	1.8	2.3	2.75	1.8
28.....	2.7	3.4	2.4	5.0	4.2	14.2	5.6	2.7	1.95	2.2	2.65	1.7
29.....	2.55	3.2	2.5	5.4	......	11.5	5.1	2.55	2.2	2.1	2.7	1.7
30.....	2.4	3.6	2.6	6.5	......	9.4	5.4	2.45	2.2	2.1	3.0	1.7
31.....	2.3	......	2.8	6.1	......	8.4	......	2.3	......	2.1	2.85	......

NOTE.— Discharge relation affected by ice January 2 to March 25, inclusive.

Daily discharge, in second-feet, of West Branch of Delaware River at Hale Eddy, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	66	220	820	395	4,550	......	5,520	2,060	280	200	200	470
2.....	70	240	760	260	2,330	......	6,770	1,740	370	200	138	420
3.....	70	182	700	420	1,740	......	5,230	1,500	470	200	115	610
4.....	70	165	640	348	1,900	......	3,560	1,350	470	200	115	610
5.....	70	165	700	302	1,900	......	3,120	1,980	470	165	115	445
6.....	70	152	610	260	880	......	2,610	3,340	395	240	81	370
7.....	68	165	760	240	1,140	......	2,420	2,330	445	370	81	370
8.....	68	152	1,500	240	880	......	5,230	1,900	420	470	96	280
9.....	61	1,740	1,420	220	420	......	11,900	1,740	760	552	165	280
10.....	63	4,950	940	220	395	......	5,820	1,580	525	1,000	200	200
11.....	59	2,610	1,000	280	280	......	4,040	1,280	470	1,070	165	200
12.....	53	1,900	880	395	126	......	3,680	1,820	302	1,000	138	182
13.....	61	1,740	880	302	70	......	3,010	4,290	240	760	115	165
14.....	61	1,740	940	325	96	......	2,420	3,230	182	640	115	152
15.....	66	1,580	940	260	280	......	2,240	2,610	165	580	115	138
16.....	66	1,280	880	348	525	......	2,710	2,420	220	470	115	126
17.....	61	1,210	760	260	580	......	2,610	1,820	165	395	115	138
18.....	57	1,210	760	260	552	2,610	2,330	1,500	138	470	138	106
19.....	61	1,140	700	220	610	1,580	2,240	1,280	115	700	880	138
20.....	370	1,280	420	182	640	470	6,610	1,140	165	470	760	115
21.....	1,280	1,420	552	220	580	325	8,630	1,000	165	370	1,350	115
22.....	1,140	1,210	498	138	525	260	5,230	880	200	370	1,980	115
23.....	470	1,140	498	115	493	200	3,450	760	152	420	1,280	106
24.....	370	1,070	880	152	470	182	2,610	640	152	525	940	96
25.....	445	1,000	760	165	395	220	2,240	580	165	470	880	115
26.....	420	1,000	760	240	......	4,680	2,610	470	115	370	700	88
27.....	525	940	498	325	......	12,400	2,910	498	115	280	498	115
28.....	470	880	325	552	......	21,000	2,610	470	152	240	445	96
29.....	395	760	370	760	......	12,700	2,150	395	240	200	470	96
30.....	325	1,000	420	1,580	......	7,830	2,420	348	240	200	640	96
31.....	280	......	525	3,120	......	6,130	......	280	......	200	552	......

NOTE.— Daily discharge given during the frozen period January 2 to March 25, inclusive, is only approximate. Daily discharge for open water periods determined from a well-defined rating curve.

Monthly discharge of West Branch of Delaware River at Hale Eddy, N. Y., for the year ending September 30, 1914

[Drainage area, 611 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	1,280	53	0.249	0.408	0.47	B
November....................	4,950	152	1,140	1.87	2.09	A
December....................	1,500	325	745	1.22	1.41	A
January....................	3,120	115	423	.692	.80	B
February....................	4,550	70	849	1.39	1.45	B
March....................	21,000	182	2,650	4.34	5.00	B
April....................	11,900	2,150	3,930	6.48	7.23	A
May....................	4,290	280	1,520	2.49	2.87	A
June....................	760	115	282	.462	.52	B
July....................	1,070	165	445	.728	.84	B
August....................	1,980	81	442	.723	.83	B
September....................	610	88	218	.337	.40	B
The year..............	21,000	53	1,080	1.77	23.91	.....

NOTE.— Mean discharge, February 26 to March 17, inclusive, estimated 648 second-feet.

SUSQUEHANNA RIVER DRAINAGE BASIN

General Features

Susquehanna river rises in Otsego lake, in northern Otsego county, at an elevation of 1,193 feet above tide, and flows in a general southerly direction into Chesapeake bay. Its course is in many places extremely tortuous, crossing the State boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles, and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York, and 260 in Maryland.

Three important streams contribute to the flow in New York State — Unadilla, Chenango and Chemung rivers. These streams all enter from the north. Unadilla, the smaller, joins the main stream near Sidney, Chenango at Binghamton, and Chemung at a point in Pennsylvania about 8 miles below the State line.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and, in places, rather broken country, bounded on the north by a mountainous area. In this part of its course its bed is of gravel or sand, with rock ledges here and there, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high, and it winds and twists among the parallel ranges in a bed composed generally of drift materials, gravels, sand and boulders. In the lower part of its course, from Marietta to Havre de Grace, it occupies a broad, deep valley, ranging in width from a few hundred feet to more than a mile, and is for the most part bounded on either shore by rocky bluffs and table-lands elevated from 100 to 500 feet above its waters.

STATION RECORDS

SUSQUEHANNA RIVER AT CONKLIN, N. Y.

Location.—At the highway bridge just below Conklin, N. Y., 8 miles above the mouth of the Chenango river at Binghamton, N. Y., and 5 miles below the mouth of Big Snake creek.

Records available.— November 13, 1912, to September 30, 1914.

Drainage area.— 2,350 square miles.

Gage.— Staff gage, with a vertical section bolted to the left abutment of the bridge, and below this, an inclined section flush with the bed of the stream. During September, 1914, an automatic recording gage was installed. It is located in a 5 by 6 foot wooden house over a 2½ by 6 foot float well. The well is connected with the river by a 4-inch pipe.

Control.— Coarse gravel and boulders.

Discharge measurements.— Made from the bridge at high and medium stages and by wading at low stages.

Winter flow.— Discharge relation affected by ice during extreme cold weather. Frequent discharge measurements are necessary to determine the flow during this period.

Accuracy.— Discharge rating curve well defined. Conditions for meter measurements are good.

Co-operation.— Station established and maintained by United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Susquehanna River at Conklin, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Jan. 8*a*	C. S. De Golyer	3.13	1,130
23*b*	do	3.46	917
Feb. 1	do	8.40	10,700
21*b*	R. S. Barnes	5.20	885
Mar. 10*c*	C. C. Covert	6.36	1,200
25*d*	R. S. Barnes	5.31	1,090
30	do	16.42	41,000
April 4	do	11.92	21,900
June 11	C. S. De Golyer	3.93	1,820
Sept. 18*e*	do	2.67	630
23*e*	H. W. Fear	2.43	488

a Measurement made under partial ice cover.
b Measurement made under complete ice cover.
c Measurement made under complete ice cover about 800 feet below gage.
d Measurement made under complete ice cover 300 feet below gage.
e Measurement made by wading 1,000 feet above gage.

Daily gage height, in feet, of Susquehanna River at Conklin, N. Y., for the year ending September 30, 1914

[Daniel Ames, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.72	2.85	4.5	3.6	8.3	4.6	13.2	7.7	3.35	3.5	2.8	4.7
2	1.82	2.8	4.4	3.45	7.7	4.6	12.6	7.5	3.31	3.25	2.8	4.1
3	1.88	2.8	4.3	3.25	6.3	4.4	13.0	6.4	3.25	3.25	2.8	4.5
4	1.82	2.65	4.2	3.3	6.1	4.5	11.7	6.0	3.2	2.65	2.75	4.9
5	1.69	2.65	4.2	3.35	5.9	4.5	9.4	5.9	3.45	2.6	2.75	4.3
6	1.75	2.65	4.1	3.35	5.7	4.5	8.3	8.8	3.5	3.1	2.75	3.9
7	1.85	2.6	4.1	3.15	5.2	4.5	7.8	7.8	3.45	3.25	2.7	3.7
8	1.91	2.5	4.6	3.15	4.6	4.5	9.6	6.7	4.1	3.2	2.75	3.6
9	1.86	3.0	4.0	3.05	4.0	4.4	13.6	6.3	4.5	3.5	2.6	3.35
10	1.91	7.1	4.7	3.2	4.0	4.3	13.6	6.1	4.6	4.5	2.6	3.3
11	1.86	7.6	4.5	3.2	4.0	4.2	10.5	5.7	4.0	4.8	2.55	3.2
12	1.86	6.3	4.4	3.25	4.4	4.2	9.4	6.4	3.6	5.2	2.7	3.1
13	1.85	5.4	4.3	3.9	5.2	4.1	8.8	9.0	3.9	5.4	4.0	3.05
14	1.85	5.1	4.3	3.9	5.3	4.1	8.1	9.3	3.2	4.9	3.6	2.9
15	1.82	5.3	4.3	3.8	5.4	4.1	7.6	7.7	3.1	4.6	3.2	2.8
16	1.88	5.3	4.3	3.8	5.5	4.2	8.4	6.5	3.0	4.2	3.05	2.75
17	1.89	5.1	4.2	3.8	5.6	4.7	8.6	6.1	2.95	3.8	3.0	2.7
18	1.88	5.0	4.1	3.6	5.5	5.8	8.2	5.7	2.95	6.1	2.9	2.65
19	1.92	4.8	4.0	3.6	5.5	7.3	7.8	5.3	2.9	6.3	3.2	2.6
20	2.2	4.7	3.9	3.5	5.4	7.2	10.8	5.3	2.9	4.1	5.3	2.55
21	4.2	5.4	3.7	3.6	5.3	6.3	13.1	4.8	2.9	3.8	5.8	2.55
22	4.2	5.3	3.7	3.5	5.2	6.0	12.6	4.5	2.95	3.6	6.8	2.46
23	3.8	4.9	3.7	3.45	5.1	5.8	10.3	4.4	2.95	3.5	5.7	2.4
24	3.5	4.7	4.3	3.4	5.0	5.5	8.4	4.3	2.95	3.45	4.7	2.55
25	3.15	4.6	4.0	3.7	4.9	5.3	7.5	4.1	3.0	3.7	4.5	2.6
26	3.15	4.6	4.0	3.8	4.7	7.6	7.5	3.9	3.0	3.6	4.1	2.75
27	3.2	4.5	4.0	3.8	4.7	11.8	9.0	4.0	2.95	3.4	3.8	2.7
28	3.15	4.4	3.6	4.0	4.6	17.0	8.2	3.9	2.9	3.25	3.6	2.65
29	3.15	4.3	3.3	4.4	......	17.4	7.5	3.9	3.4	3.15	3.45	2.5
30	3.05	4.4	3.7	5.4	......	17.3	7.7	3.5	3.3	3.25	3.8	2.5
31	2.95	......	3.8	7.1	......	14.6	......	3.45	......	3.0	4.6	......

NOTE.— Discharge relation affected by ice January 13 to March 26, inclusive.

Daily discharge, in second-feet, of Susquehanna River at Conklin, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	192	828	2,690	1,500	10,500	......	27,200	9,500	1,200	1,350	740	2,990
2.....	226	790	2,540	1,350	9,000	......	24,800	9,000	1,150	1,100	740	2,070
3.....	249	790	2,390	1,170	5,720	......	26,400	6,400	1,100	1,100	740	2,670
4.....	226	685	2,240	1,210	5,280	......	21,500	5,500	1,060	635	705	3,330
5.....	182	685	2,240	1,260	4,840	......	14,000	5,280	1,300	600	705	2,360
6.....	202	685	2,100	1,260	4,430	......	11,000	12,300	1,350	970	705	1,810
7.....	238	652	2,100	1,080	3,500	......	9,740	9,740	1,300	1,100	670	1,570
8.....	262	590	2,840	1,080	2,540	1,350	14,000	7,100	2,070	1,060	705	1,460
9.....	241	948	1,970	991	1,600	1,260	28,900	6,170	2,670	1,350	600	1,200
10.....	262	8,040	3,000	1,120	1,170	1,170	28,900	5,720	2,830	2,670	600	1,150
11.....	241	9,240	2,690	1,120	866	1,120	17,400	4,840	1,940	3,160	565	1,060
12.....	241	6,170	2,540	1,170	805	1,080	14,000	6,400	1,460	3,860	670	970
13.....	238	4,230	2,390	......	1,170	991	12,300	12,800	1,810	4,230	1,940	930
14.....	238	3,680	2,390	......	1,170	948	10,500	13,700	1,060	3,330	1,460	810
15.....	226	4,040	2,390	......	1,210	948	9,240	9,500	970	2,830	1,060	740
16.....	249	4,040	2,390	......	1,210	1,080	11,300	6,630	890	2,210	930	705
17.....	253	3,680	2,240	......	1,210	1,600	11,800	5,720	850	1,690	890	670
18.....	249	3,500	2,100	......	1,170	3,000	10,800	4,840	850	5,720	810	635
19.....	260	3,160	1,970	......	1,120	6,170	9,740	4,040	810	6,170	1,060	600
20.....	413	3,000	1,840	948	1,030	4,840	18,400	4,040	810	2,070	4,040	565
21.....	2,240	4,230	1,600	991	948	2,840	26,800	3,160	810	1,690	5,060	565
22.....	2,240	4,040	1,600	948	866	1,970	24,800	2,670	850	1,460	7,330	506
23.....	1,720	3,330	1,600	907	754	1,600	16,800	2,510	850	1,350	4,840	482
24.....	1,400	3,000	2,390	790	685	1,260	11,300	2,360	850	1,300	2,990	565
25.....	1,080	2,840	1,970	1,120	652	1,080	9,000	2,070	890	1,570	2,670	600
26.....	1,080	2,840	1,970	1,210	......	6,630	9,000	1,810	890	1,460	2,070	705
27.....	1,120	2,690	1,970	1,210	......	21,800	12,800	1,940	850	1,250	1,690	670
28.....	1,080	2,540	1,500	1,450	......	44,700	10,800	1,810	810	1,100	1,460	635
29.....	1,080	2,390	1,210	1,970	......	46,700	9,000	1,810	1,250	1,020	1,300	530
30.....	991	2,540	1,600	3,680	......	16,200	9,500	1,350	1,150	1,100	1,690	530
31.....	907	......	1,720	7,560	......	33,200	......	1,300	......	890	2,830	......

NOTE.— Daily discharge values given during the frozen period January 13 to March 26, are only approximate. Daily discharge determined from a rating curve that is very well defined. New rating curve used beginning April 1, 1914.

Monthly discharge of Susquehanna River at Conklin, N. Y., for the year ending September 30, 1914
[Drainage area, 2,350 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	2,240	182	640	0.272	0.31	A
November	9,240	590	3,000	1.28	1.43	A
December	3,000	1,210	2,130	.910	1.05	A
January	7,560	790	1,450	.617	.71	B
February	10,500	652	2,370	1.01	1.05	B
March	46,700	948	7,830	3.33	3.84	B
April	28,900	9,000	15,700	6.68	7.45	A
May	13,700	1,300	5,550	2.36	2.72	A
June	2,830	810	1,220	.519	.58	A
July	6,170	600	1,980	.843	.97	A
August	7,330	565	1,750	.745	.86	A
September	3,330	482	1,140	.485	.54	A
The year	46,700	182	3,730	1.59	21.51	......

NOTE.— Mean discharge estimated as follows: January 13 to 19, 1,180 second-feet; February 26 to March 7, 1,210 second-feet.

CHENANGO RIVER NEAR CHENANGO FORKS, N. Y.

Location.— Two miles by road below Chenango Forks post office, 1.5 miles below the mouth of Tioughnioga river and 11.5 miles above the mouth of river at Binghamton, N. Y.

Records available.— November 11, 1912, to September 30, 1914.

Drainage area.— 1,420 square miles.

Gage.— Inclined staff gage on the left bank.

During September, 1914, an automatic recording gage was installed. The gage is set over a 2½ by 6 foot float well and is protected by a 5 by 6 foot wooden house. The float well is connected with the river by a 4-inch pipe.

Control.— Small cobble filled in with sand and gravel; not likely to shift; current uniform across the entire section.

Discharge measurements.— Low-water measurements made by wading near the gage; high-water measurements made from cable and car.

Winter flow.— Discharge relation affected by ice. Good estimates of flow can be made from frequent discharge measurements made during this period.

Diversions.— In estimating the run-off, the area directly tributary to storage reservoirs, from which diversion is made to the Erie canal, has been deducted from the total natural drainage area. At the head of Chenango river there are six reservoirs aggregating 30 square miles and at the head of the Tioughnioga one — De Ruyter — of 18.2 square miles. These areas have been subtracted from the total area of 1,468 square miles. This gives a net drainage area of 1,420 square miles.

Accuracy.— Discharge rating curve well defined. Conditions for making meter measurements good. Small diurnal fluctuation in gage height at extreme low water.

Co-operation.— Established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Chenango River near Chenango Forks, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 29	R. S. Barnes	3.12	670
1914			
Jan. 7	C. S. De Golyer	3.34	842
7	do	3.40	915
22[a]	do	3.98	788
24[a]	do	3.94	750
31	do	6.43	6,100
Feb. 20[a]	R. S. Barnes	5.50	814
Mar. 9[b]	C. C. Covert	4.60	830
20[b]	C. S. De Golyer	5.61	2,080
23[b]	R. S. Barnes	5.24	1,880
29	do	12.90	31,500
29	do	12.50	29,400
April 3	do	9.58	17,200
4	do	7.60	10,300
July 26[c]	C. S. De Golyer	3.55	1,090

[a] Backwater from ice. Measurement made through ice 500 feet above gage.
[b] Backwater from ice. Measurement made through ice opposite gage.
[c] Measurement made by wading 300 feet below gage.

Daily gage height, in feet, of Chenango River near Chenango Forks, N. Y., for the year ending September 30, 1914

[Mrs. Ella Ingraham, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	2.4	3.1	4.0	3.6	8.0	4.4	9.9	5.4	3.3	3.5	2.75	4.2
2.....	2.42	2.95	3.8	3.4	6.7	4.35	10.2	5.0	3.6	3.25	2.72	4.0
3.....	2.42	2.94	3.6	3.4	5.9	4.35	9.6	4.6	3.5	3.0	2.65	5.0
4.....	2.38	2.85	3.5	3.4	6.0	4.35	7.9	4.45	3.4	3.2	2.8	4.9
5.....	2.4	2.92	3.5	3.4	5.7	4.4	7.0	4.7	3.2	2.95	2.82	4.15
6.....	2.45	2.95	3.4	3.4	5.1	4.5	6.4	6.2	3.2	2.9	2.72	3.85
7.....	2.42	2.88	3.4	3.4	4.7	4.5	6.2	5.1	3.2	2.9	2.7	3.7
8.....	2.45	2.8	3.7	3.3	4.4	4.6	8.8	4.5	3.7	2.9	2.78	3.6
9.....	2.48	2.92	4.2	3.3	4.0	4.6	11.1	4.6	3.8	2.95	2.75	3.4
10.....	2.32	4.05	3.7	3.4	4.5	4.6	9.2	4.35	3.5	3.1	2.7	3.3
11.....	2.38	5.1	3.65	3.4	5.4	4.45	7.8	4.3	3.4	2.9	2.88	3.25
12.....	2.35	4.9	3.7	3.45	5.9	4.4	7.6	4.5	3.2	2.9	3.1	3.2
13.....	2.48	5.6	3.4	3.8	5.4	4.4	7.1	8.2	3.1	2.9	3.0	3.1
14.....	2.48	5.0	3.6	3.6	5.4	4.4	6.6	6.8	3.0	2.9	2.88	3.05
15.....	2.4	4.2	3.9	3.4	5.4	4.4	6.5	5.6	2.95	2.9	2.82	3.0
16.....	2.45	3.95	3.6	3.35	5.4	4.5	7.2	5.1	2.82	2.9	2.8	2.95
17.....	2.34	4.1	3.6	3.65	5.4	4.8	7.0	4.7	2.9	2.9	2.7	2.91
18.....	2.42	3.95	3.6	4.05	5.5	5.6	6.7	4.45	2.9	3.35	2.8	2.86
19.....	2.48	3.8	3.45	4.05	5.5	5.8	6.6	4.25	2.9	3.6	2.95	2.85
20.....	2.58	3.75	3.3	3.9	5.4	5.5	8.2	4.1	2.9	3.1	3.0	2.82
21.....	3.5	3.9	3.2	3.6	5.4	5.4	8.6	3.95	2.95	3.0	5.7	2.82
22.....	3.8	4.3	3.4	4.0	5.2	5.4	7.6	3.8	3.0	2.98	5.4	2.8
23.....	3.8	4.05	3.55	4.0	5.0	5.2	6.6	3.75	2.92	2.92	4.45	2.82
24.....	3.7	4.3	3.85	4.0	5.0	5.0	5.9	3.7	2.9	2.98	4.1	2.92
25.....	3.5	4.2	3.9	4.0	4.9	5.0	5.4	3.6	2.9	3.1	3.8	2.88
26.....	3.4	3.9	3.8	4.0	4.8	6.4	6.4	3.55	2.85	3.2	3.6	2.9
27.....	3.3	3.8	3.5	4.0	4.7	11.5	6.8	3.5	2.8	2.95	3.45	2.84
28.....	3.3	3.6	3.3	4.0	4.6	13.1	6.1	3.5	2.85	2.82	3.3	2.8
29.....	3.2	3.7	3.4	4.6	......	13.1	5.7	3.4	5.2	2.75	3.7	2.8
30.....	3.1	3.9	3.6	6.7	......	11.3	5.9	3.4	4.1	2.75	4.7	2.85
31.....	3.05	......	3.7	6.4	......	10.3	......	3.35	......	2.8	4.5	......

NOTE.— Discharge relation affected by ice January 6 to March 26, inclusive.

Daily discharge, in second-feet, of Chenango River near Chenango Forks, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	178	660	1,780	1,200	10,600	660	18,600	4,390	850	1,080	381	2,100
2.....	188	531	1,470	960	6,830	616	19,800	3,550	1,200	800	361	1,780
3.....	188	523	1,200	960	4,840	616	17,400	2,790	1,080	572	316	3,550
4.....	168	453	1,080	960	5,070	616	11,200	2,520	960	750	416	3,350
5.....	178	507	1,080	960	4,390	660	8,500	2,970	750	531	431	2,020
6.....	203	531	960	905	3,160	750	6,830	6,310	750	491	361	1,540
7.....	188	476	960	905	2,440	800	6,310	3,750	750	491	348	1,330
8.....	203	416	1,330	800	1,940	850	14,200	2,610	1,330	491	402	1,200
9.....	219	507	2,100	800	1,330	830	23,400	2,790	1,470	531	381	960
10.....	141	1,860	1,330	850	1,080	800	15,800	2,360	1,080	660	348	850
11.....	168	3,750	1,260	905	850	660	10,900	2,270	960	491	476	800
12.....	155	3,350	1,330	......	750	616	10,300	2,610	750	491	660	750
13.....	219	4,840	960	......	660	616	8,800	12,100	660	491	572	660
14.....	219	3,550	1,200	......	750	616	7,370	7,930	572	491	476	616
15.....	178	2,100	1,620	......	705	616	7,100	4,840	531	491	431	572
16.....	203	1,700	1,200	......	750	705	9,100	3,750	431	491	416	531
17.....	150	1,940	1,200	......	750	1,020	8,500	2,970	491	491	348	499
18.....	188	1,700	1,200	......	800	2,180	7,650	2,520	491	905	416	461
19.....	219	1,470	1,020	850	800	2,520	7,370	2,180	491	1,200	531	453
20.....	274	1,400	850	705	750	1,940	12,100	1,940	491	660	572	431

Daily discharge, in second-feet, of Chenango River near Chenango Forks, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
21.....	1,080	1,620	750	438	660	1,780	13,400	1,700	531	572	5,070	431
22.....	1,470	2,270	960	788	531	1,780	10,300	1,470	572	555	4,390	416
23.....	1,470	1,860	1,140	800	416	1,780	7,370	1,400	507	507	2,520	431
24.....	1,330	2,270	1,540	800	381	1,940	5,550	1,330	491	555	1,940	507
25.....	1,080	2,100	1,620	800	453	2,180	4,390	1,200	491	660	1,470	476
26.....	960	1,620	1,470	800	453	5,800	6,830	1,140	453	750	1,200	491
27.....	850	1,470	1,080	800	555	24,200	7,930	1,080	416	531	1,020	446
28.....	850	1,200	850	800	705	31,000	6,050	1,080	453	431	850	416
29.....	750	1,330	960	1,470	......	33,000	5,070	960	3,960	381	1,330	416
30.....	660	1,620	1,200	3,550	......	24,200	5,550	960	1,940	381	2,970	453
31.....	616	......	1,330	6,830	......	20,200	......	905	......	416	2,610	......

NOTE.— Daily discharge values given during the frozen period January 6 to March 26 are only approximate. Daily discharge for open water periods determined from a rating curve that is very well defined.

Monthly discharge of Chenango River near Chenango Forks, N. Y., for the year ending September 30, 1914

[Drainage area, 1,420 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	1,470	141	482	0.339	0.39	B
November..................	4,840	416	1,650	1.16	1.29	A
December..................	2,100	750	1,230	.866	1.00	A
January....................	6,830	....	1,080	.761	.88	B
February...................	10,600	416	1,910	1.35	1.41	B
March......................	33,000	616	5,370	3.78	4.36	B
April........................	23,400	4,390	10,100	7.13	7.96	A
May.........................	12,100	905	2,920	2.06	2.38	A
June........................	3,960	416	863	.608	.68	B
July.........................	1,200	381	592	.417	.48	B
August.....................	5,070	316	1,100	.775	.89	A
September.................	3,550	416	965	.680	.76	B
The year..............	33,000	141	2,350	1.65	22.48	......

NOTE.— Mean discharge January 12 to 18, estimated 568 second-feet.

CHEMUNG RIVER AT CHEMUNG, N. Y.

Location.—About midway between Chemung, N. Y., and Willawana, Pa., about half a mile upstream from the State line, and about 10 miles above the junction with the Susquehanna.

Records available.— September 7, 1903, to September 30, 1914.

Drainage area.— 2,440 square miles. (From U. S. Geological Survey water supply papers.)

Gage.— Tape and weight, read twice daily; located at different points as follows: September 7, 1903, to April 19, 1911, on the suspension bridge; April 20, 1911, to February 18, 1912, temporarily located about 250 feet upstream from the bridge while the bridge was being replaced; February 19, to December 31, 1912, gage on the new two-span steel truss bridge, on the site of the old bridge; datum same for all locations of the gage.

Control — Composed of sand and gravel; occasionally shifting.

Discharge measurements.— Made from the bridge.

Winter flow.— Discharge relation affected by ice. Gage observations suspended during frozen period.

Regulation.— Largest water power development on the river is at Elmira, N. Y. No dams on the river between Elmira and the mouth of the Chemung.

Accuracy.— Conditions for accurate determination of discharge during the open period only fair.

Co-operation.— Established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Chemung River at Chemung, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Mar. 24	R. S. Barnes	4.30	2,560
31	do	11.40	25,400
Sept. 24[a]	H. W. Fear	2.01	274
24[b]	C. S. De Golyer	1.99	252

[a] Measurement made by wading 500 feet below gage.
[b] Measurement made by wading 600 feet below gage.

Daily gage height, in feet, of Chemung River at Chemung, N. Y., for the year ending September 30, 1914

[D. L. Orcutt, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.76	3.5	3.2	......	11.0	......	9.1	4.7	3.25	2.35	1.96	2.85
2	1.85	3.3	3.1	......	7.5	......	10.2	4.4	3.1	2.30	1.96	2.75
3	2.35	3.15	3.1	......	6.5	......	9.7	4.1	3.0	2.24	1.96	3.9
4	2.25	3.05	3.05	4.3	7.0	......	7.8	3.9	2.95	2.20	1.90	4.2
5	2.14	2.9	2.9	4.2	7.1	......	6.8	4.2	3.2	2.18	1.93	3.6
6	2.08	2.85	2.9	......	5.7	......	6.1	11.4	3.25	2.16	1.92	3.3
7	2.00	2.75	2.85	......	5.2	......	5.8	8.9	3.1	2.14	1.87	3.0
8	1.96	2.75	2.95	......	4.8	......	10.6	6.8	2.95	2.12	1.89	2.8
9	1.94	3.4	3.2	......	3.9	......	11.6	7.5	2.85	2.12	2.39	2.7
10	1.91	10.6	2.95	......	3.7	......	8.8	8.3	2.95	2.20	2.46	2.6
11	1.86	6.7	2.5	......	3.7	......	7.8	6.7	2.8	2.24	2.21	2.48
12	1.90	5.3	2.75	......	......	......	7.2	9.2	2.75	2.46	2.12	2.43
13	1.88	4.8	2.8	......	......	......	6.5	15.1	2.65	2.46	2.08	2.36
14	2.07	4.8	2.95	......	......	......	5.9	12.3	2.6	2.36	2.09	2.32
15	2.07	5.2	2.9	......	......	......	5.6	8.4	2.5	2.32	2.12	2.26
16	2.06	4.7	2.9	......	......	......	8.3	6.9	2.49	2.38	2.02	2.20
17	1.92	4.7	2.85	......	......	8.1	9.0	6.0	2.42	2.8	2.06	2.16
18	1.91	4.5	2.8	......	......	9.2	7.8	5.4	2.36	2.9	2.01	2.12
19	1.89	4.2	2.75	......	......	6.2	6.9	5.0	2.34	2.48	2.8	2.08
20	2.29	4.1	2.6	......	......	5.6	6.6	4.6	2.38	2.24	3.7	2.04
21	3.7	4.0	2.7	......	......	5.0	7.7	4.4	2.39	2.21	5.1	2.05
22	3.9	3.9	2.7	......	......	4.8	6.5	4.1	2.42	2.12	6.0	2.04
23	3.25	3.7	2.65	......	......	4.5	5.9	3.9	2.4	2.09	4.3	1.98
24	2.95	3.6	3.1	......	......	4.3	5.3	3.7	2.38	2.06	3.6	2.00
25	2.85	3.45	3.8	......	......	4.7	4.9	3.6	2.32	2.04	3.5	1.98
26	5.0	3.4	3.7	......	......	10.1	5.4	3.45	2.31	2.04	3.4	2.03
27	7.4	3.25	3.1	......	......	14.3	6.0	3.7	2.29	2.04	3.1	2.02
28	5.2	3.2	3.1	......	......	16.0	5.4	5.1	2.28	2.06	2.9	2.00
29	4.4	3.15	3.15	......	......	15.5	5.0	4.3	2.32	2.06	2.7	1.95
30	4.0	3.15	3.2	11.8	......	11.4	5.0	3.8	2.42	2.04	2.9	1.96
31	3.7	......	3.25	10.5	......	11.2	......	3.45	......	2.05	2.95	......

NOTE.— Discharge relation affected by ice from about January 21 to 29, and February 12 to March 16, inclusive. Measurements made during 1914 indicate a shift in the discharge relation.

Daily discharge, in second-feet, of Chemung River at Chemung, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	DAY	Oct.	Nov.	Dec.
1	126	1,380	1,060	16	250	3,170	770
2	160	1,160	960	17	188	3,170	730
3	400	1,010	960	18	184	2,800	690
4	345	910	910	19	176	2,310	655
5	290	770	770	20	365	2,160	550
6	260	730	770	21	1,620	2,020	620
7	220	655	730	22	1,880	1,880	620
8	204	655	815	23	1,110	1,620	585
9	196	1,270	1,060	24	815	1,500	960
10	184	21,600	815	25	730	1,320	1,750
11	164	7,840	490	26	3,760	1,270	1,620
12	180	4,400	655	27	9,900	1,110	960
13	172	3,360	690	28	4,180	1,060	960
14	255	3,360	815	29	2,630	1,010	1,010
15	255	4,180	770	30	2,020	1,010	1,060
				31	1,620	......	1,110

Monthly discharge of Chemung River at Chemung, N. Y., for the year ending September 30, 1914

[Drainage area, 2,440 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	9,900	126	1,120	.459	.53	B
November	21,600	655	2,690	1.10	1.23	A
December	1,750	490	868	.356	.41	B

OHIO RIVER DRAINAGE BASIN

ALLEGHENY RIVER BASIN

General Features

Allegheny river drains the western slopes of the Allegheny mountains in Pennsylvania and New York.

The river rises in the central part of Potter county, in northern Pennsylvania, flows in a general northwesterly direction into New York to about the central part of Cattaraugus county, where it turns and flows southwestward back into Pennsylvania; at Franklin, in Venango county, it turns and flows southeastward to the mouth of Mahoning creek, in Armstrong county, where it again bends to the southwest, and at Pittsburgh joins the Monongahela to form the Ohio. The river is about 290 miles long (map measurement) and its drainage area, which is nearly 50 per cent. greater than that of the Monongahela, comprises about 11,100 square miles.

The noteworthy tributaries in New York are Oswayo, Olean and Tunungwant creeks. Oswayo and Tunungwant creeks rise in Pennsylvania. Two other important creeks — Conewango and Brokenstraw — have their sources in New York State but are tributary to the main stream at points in Pennsylvania.

The elevation of the sources of the river is about 2,500 feet above sea level; at Olean, N. Y., the elevation is 1,420 feet; at Franklin, Pa., the elevation is 960 feet; at Pittsburgh the elevation is 692 feet.

The basin is somewhat regular in shape, being about 2½ times as long as it is wide. Its northwestern boundary is at one point about 8 miles from Lake Erie, lying within about 40 miles of Buffalo. Below Franklin, Pa., the river flows near the western boundary of its basin. The surrounding country is made up of high hills or mountains separated by deep valleys, but west of the main river the country is less mountainous though the surface is still rolling and hilly.

The bed of the stream is composed chiefly of gravel ranging in size from small pebbles to cobblestones. The banks are made up of sand, gravel or clay. The area is underlain by shales, and except in stream valleys the soil has little depth.

This basin is exceptionally rich in natural resources, coal, oil, gas, limestone, glass sand, and building stones occurring in abundance.

This basin was at one time covered with timber, the principal varieties being pine and hemlock. At present, however, only light forests and brush are found at the headwaters of the tributaries, the pine and hemlock having been cut off some time ago.

The mean annual rainfall in this region is about 40 inches and the winters are severe. Snowfall is heavy in the upper part of the basin and lasts for long periods, and ice forms to a thickness of about 2 feet. The heavy ice during the spring floods is very destructive. Jams frequently occur which cause considerable damage from backwater.

Allegheny river is subject to very severe floods, which cause heavy losses to manufacturing and other interests along the river.

The fall of the main river and tributaries is comparatively large and if the stream were in a district where fuels were more expensive, it would undoubtedly be much used for power. When the price of coal advances so that water power can compete with steam, the water power on this stream will be more extensively developed.

The Cuba reservoir, which feeds the Erie canal through Genesee river, lies on the divide between the Allegheny and Genesee drainage basins. Part of the overflow from this reservoir passes into the Allegheny and the rest into the Genesee.

STATION RECORDS

ALLEGHENY RIVER AT RED HOUSE, N. Y.

Location.—At highway bridge at Red House, on the road leading from the Pennsylvania Railroad station to the Erie Railroad station; about 5 miles below Salamanca and 13 miles above the State line between New York and Pennsylvania. Conewango creek, the outlet of Chautauqua lake, enters the Allegheny in the State of Pennsylvania.

Records available.— September 4, 1903, to September 30, 1914.

Drainage area.— 1,640 square miles. (From U. S. Geological Survey water supply papers.)

Gage.— Standard chain, attached to the upstream side of bridge near left-hand end; datum unchanged. Read once daily to half tenths.

Channel.— Coarse gravel occasionally shifting. Current good for medium and high stages; rather slow at low stages.

Discharge measurements.— Made from downstream side of bridge.

Winter flow.— Ice usually affects the relation between gage height and discharge for short periods during the winter months. Gage observations suspended during these periods.

Regulation.— Low-water flow may be slightly affected by the operation of several small power plants above Salamanca. At Olean, N. Y., a wasteway from Cuba reservoir enters the river through Olean creek. This reservoir is on the divide between Oil creek, tributary to Allegheny river, and Genesee river, tributary to Lake Ontario. The stored water is commonly turned into Genesee river through the abandoned summit level of Genesee river canal but may be diverted into Oil creek through a guard lock at the head of the canal.

Accuracy.— Records fairly good.

Co-operation.— Station established and maintained by the United States Geological Survey in co-operation with the State Engineer and Surveyor.

Discharge measurements of Allegheny River at Red House, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Aug. 24.......	C. S. De Golyer....................................	3.62	704
24.......	do	3.65	734

Daily gage height, in feet, of Allegheny River at Red House, N. Y., for the year ending September 30, 1914

[W. E. Coe, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	3.2	3.45	4.1	3.85	......	......	9.8	4.6	3.8	3.25	3.1	3.75
2.....	3.5	3.75	4.15	3.85	......	......	8.4	4.45	3.85	3.3	3.1	3.7
3.....	3.55	3.9	4.1	3.8	......	......	7.6	4.0	3.9	3.35	3.0	3.5
4.....	3.45	4.0	4.0	3.95	......	......	7.2	4.1	3.8	3.3	3.0	3.55
5.....	3.30	3.85	4.1	3.8	......	......	7.7	4.6	4.2	3.3	3.0	3.7
6.....	3.45	4.0	4.05	3.8	......	......	7.5	7.2	3.9	3.2	3.0	3.4
7.....	3.4	4.05	4.1	3.85	......	......	8.2	6.8	3.55	3.25	3.0	3.45
8.....	3.3	4.0	4.1	3.9	5.2	......	8.4	6.6	3.7	3.3	3.0	3.4
9.....	3.3	5.7	4.2	3.95	4.95	......	8.2	6.5	3.75	3.3	3.05	3.3
10.....	3.45	5.6	4.1	4.2	4.25	......	7.8	6.6	3.55	3.3	3.05	3.3
11.....	3.35	5.4	4.0	4.6	4.8	......	7.7	8.5	3.3	3.2	3.0	3.35
12.....	3.4	5.6	4.1	4.75	4.45	......	7.1	8.8	3.4	3.25	3.0	3.25
13.....	3.45	6.5	4.05	......	4.55	......	7.0	10.4	3.5	3.3	3.0	3.1
14.....	3.3	6.5	4.2	......	4.5	3.6	7.3	10.4	3.5	3.3	3.1	3.15
15.....	3.35	6.6	4.35	......	4.35	3.8	7.4	8.4	3.55	3.3	3.0	3.15
16.....	3.3	6.6	4.25	......	4.4	4.45	7.2	6.8	3.5	3.25	3.1	3.15
17.....	3.4	6.5	4.2	......	4.05	5.0	7.2	5.6	3.4	3.3	3.2	3.1
18.....	3.35	6.0	4.2	......	4.0	7.6	7.0	5.6	3.65	3.3	3.1	3.15
19.....	3.3	6.0	4.15	......	3.8	6.2	7.0	4.85	3.55	3.25	3.2	3.15
20.....	3.3	5.2	4.2	......	3.8	5.3	7.0	4.45	3.6	3.25	3.25	3.1
21.....	3.3	4.8	4.0	......	3.95	5.8	7.2	4.55	3.4	3.2	3.1	3.1
22.....	3.35	4.65	4.1	......	3.8	5.2	7.2	4.8	3.5	3.25	3.2	3.15
23.....	3.3	4.55	4.1	......	......	4.9	6.8	4.9	3.6	3.0	3.25	3.15
24.....	3.5	4.65	4.1	......	......	4.75	6.4	4.5	3.5	3.0	3.55	3.15
25.....	3.55	4.5	4.25	......	......	4.9	5.0	4.55	3.4	3.15	3.6	3.1
26.....	3.45	4.5	4.3	......	......	7.6	5.2	4.4	3.4	3.1	3.65	3.05
27.....	3.55	4.4	4.0	5.5	......	9.2	4.95	4.55	3.45	3.1	3.65	3.0
28.....	3.55	4.25	3.9	5.6	......	11.7	4.7	4.4	3.3	3.1	3.6	3.05
29.....	3.45	4.25	3.95	7.0	......	11.4	4.75	4.65	3.3	3.0	3.55	3.0
30.....	3.5	4.35	3.9	9.0	......	10.6	4.8	4.45	3.3	3.0	3.7	3.0
31.....	3.5	......	3.8	9.0	......	10.4	......	4.4	......	3.15	3.6	......

NOTE.— Discharge relation affected by ice from January 7 to 26, inclusive, and from about February 20 to March 13, inclusive.

Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	330	550	1,300	980	......	......	19,800	2,070	920	370	260	865
2.....	600	865	1,370	980	......	......	13,200	1,820	980	410	260	810
3.....	650	1,040	1,300	920	......	......	10,200	1,170	1,040	455	200	600
4.....	550	1,170	1,170	1,100	......	......	8,750	1,300	920	410	200	650
5.....	410	980	1,300	920	......	......	10,500	2,070	1,440	410	200	810
6.....	550	1,170	1,240	920	......	......	9,800	8,750	1,040	330	200	500
7.....	500	1,240	1,300	......	......	......	12,400	7,390	650	370	200	550
8.....	410	1,170	1,300	......	3,200	......	13,200	6,780	810	410	200	500
9.....	410	4,320	1,440	......	2,700	......	12,400	6,480	865	410	230	410
10.....	550	4,080	1,300	......	1,520	......	10,800	6,780	650	410	230	410
11.....	455	3,630	1,170	......	2,420	......	10,500	13,600	410	330	200	455
12.....	500	4,080	1,300	......	1,820	......	8,400	15,000	500	370	200	370
13.....	550	6,480	1,240	......	1,980	......	8,050	22,900	600	410	200	260
14.....	410	6,480	1,440	......	1,900	700	9,100	22,900	600	410	260	295
15.....	455	6,780	1,660	......	1,660	920	9,450	13,200	650	410	200	295
16.....	410	6,780	1,520	......	1,740	1,820	8,750	7,390	600	370	260	295
17.....	500	6,480	1,440	......	1,240	2,800	8,750	4,080	500	410	330	260
18.....	455	5,090	1,440	......	1,170	10,200	8,050	4,080	755	410	260	295
19.....	410	5,090	1,370	......	920	5,630	8,050	2,520	650	370	330	295
20.....	410	3,200	1,440	......	......	3,410	8,050	1,820	700	370	370	260
21.....	410	2,420	1,170	......	......	4,570	8,750	1,980	500	330	260	260
22.....	455	2,160	1,300	......	......	3,200	8,750	2,420	600	370	330	295
23.....	410	1,980	1,300	......	......	2,610	7,390	2,610	700	200	370	295
24.....	600	2,160	1,300	......	......	2,330	6,190	1,900	600	200	650	295
25.....	650	1,900	1,520	......	......	2,610	2,800	1,980	500	295	700	260
26.....	550	1,900	1,590	......	......	10,200	3,200	1,740	500	260	755	230
27.....	650	1,740	1,170	3,850	......	16,800	2,700	1,980	550	260	755	200
28.....	650	1,520	1,040	4,080	......	30,000	2,240	1,740	410	260	700	230
29.....	550	1,520	1,100	8,050	......	28,400	2,330	2,160	410	200	650	200
30.....	600	1,660	1,040	15,900	......	24,000	2,420	1,820	410	200	810	200
31.....	600	......	920	15,900	......	22,900	......	1,740	......	295	700	......

NOTE.— Mean discharge for frozen periods estimated by comparison with records of Genesee river at St. Helena and Chenango near Chenango Forks. Daily discharge for open water period determined from a fairly well defined rating curve.

Monthly discharge of Allegheny River at Red House, N. Y., for the year ending September 30, 1914
[Drainage area, 1,640 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	650	330	505	.308	.36	B
November	6,780	550	2,990	1.82	2.03	B
December	1,660	920	1,310	.799	.92	B
January	15,900	....	2,310	1.41	.163	C
February	....	....	2,500	1.52	1.58	C
March	30,000	....	5,940	3.62	4.17	B
April	19,800	2,240	8,500	5.18	5.78	A
May	22,900	1,170	5,620	3.43	3.95	A
June	1,440	410	682	.416	.47	B
July	445	200	346	.211	.24	B
August	810	200	370	.226	.26	B
September	865	200	388	.237	.27	B
The year	30,000	200	2,620	1.60	21.66	.....

NOTE.— Mean discharge estimated as follows: January 7 to 26, inclusive, 900 second-feet; February 1 to 7, inclusive, 6,900 second-feet; February 20 to 28, inclusive, 711 second feet; March 1 to 13, inclusive, 842 second-feet.

ST. LAWRENCE RIVER DRAINAGE BASIN

General Features

The surface waters of an area of 565,000 square miles in extent pass to the ocean by way of St. Lawrence river. In form this area is an irregular parallelogram extending southwestward for about 900 miles with a fairly uniform breadth of 250 miles. The Great Lakes, into which the river expands, have a water surface of 95,600 square miles, leaving for the land surface drained by the river about 470,000 square miles. More than eight-tenths of this area belongs to Canada. The remainder constitutes a part of the United States. With the exception of about 50,000 square miles (including the whole of the Gaspe Peninsula) in the eastern part of the Province, the Canadian portion lies wholly on the north side of the river. The only part of the United States lying north of the river is at the west end of Lake Superior.

At its mouth the river and its tributaries are drowned, so that the salt water of the ocean enters to form the broad bay of St. Lawrence, with its irregular margin, and even beyond the bay there is indication of a river valley carved in the continental shelf completely covered by the ocean waters. Upstream from the bay of St. Lawrence the water area narrows and the water freshens, though the tide rises nearly as far as Montreal, where the St. Lawrence is a very broad river with gentle current. Just above Montreal the river becomes a series of violent rapids, and from this point upstream it consists of stretches of quiet water separated by rapids. At the outlet of Lake Ontario the river passes through a maze of islands beyond which is Lake Ontario — the lowest of the five Great Lakes.

The lakes are connected by broad rivers and straits, which in places are navigable, are elsewhere interrupted by rapids, and in one place are broken by one of the great falls of the world — Niagara. To the entire area above the mouth of Lake Ontario no large river is tributary. In places the divide runs close to the lakes and is nowhere far from them.

In the northwestern part of the State of New York, between Niagara and St. Lawrence rivers, is an area aggregating 12,400 square miles drained by streams which flow into Lake Ontario. The divide which controls this drainage is very irregular. Extending to the south and southeast from Fort Niagara, it passes around the headwaters of the Genesee a short distance into Pennsylvania; thence re-entering New York it runs southward and eastward from the interior group of lakes, turns to the north, encircles the sources of Black river, turns again to the west, and descends to the lake. The country thus included is level or gently undulating in the counties bordering the lake, but farther south it becomes more rolling, and a series of ridges, gradually increasing in height, stretch down between Cayuga and Seneca and their companion lakes, finally becoming merged with the elevated, broken country forming the principal divide whose abrupt slopes reach altitudes of 2,000 to 2,500 feet above the headwaters of the Genesee. The easterly or Black river lobe of the drainage basin receives the run-off from the southwestern slope of the Adirondack mountains — largely a rugged and forest-covered area receiving heavy precipitation, especially in the winter. The principal streams of the area are Genesee, Oswego (formed by the union of Seneca and Oneida rivers, which drain the chain of lakes in central New York), Salmon, and Black rivers. A small area in the western part of the State is drained by Lake Erie.

St. Lawrence river receives also the flow of a number of New York streams rising on the northerly slopes of the Adirondacks and fed by the innumerable lakes with which the region is dotted. Some of these rivers, as the Grass, Raquette, and St. Regis, lie entirely within the United States; others, notably Salmon, Trout, Chateaugay, and English rivers, cross the international boundary and flow northward into the St. Lawrence in Canada, as does also Richelieu river, the outlet of Lake Champlain. The following table gives a list of the principal tributaries of the St. Lawrence in the United States, with the areas drained by them.

Drainage Areas of St. Lawrence River Tributaries in the United States

	Square miles		Square miles
Oswegatchie river	1,609	Salmon river[1]	273
Grass river	637	Trout river[2]	129
Raquette river	1,219	Chateaugay river[2]	199
St. Regis river	910	English river[2]	53
Little Salmon river[1]	103	Lake Champlain[2]	8,187

The St. Lawrence drains, through Lake Champlain, an area of about 4,560 square miles in the State of Vermont. This drainage is practically all from Missisquoi, Lamoille, and Winooski rivers and Otter creek. Clyde, Barton, and Black rivers, in northern Vermont, are tributary to St. Lawrence river through Lake Memphremagog and St. Francis river.

STREAMS TRIBUTARY TO LAKES ERIE AND ONTARIO[3]

Cattaraugus Creek

Cattaraugus creek rises in the southwestern part of Wyoming county and flows in a westerly direction, entering Lake Erie about 25 miles southwest of Buffalo, on the boundary line between Erie and Chautauqua counties. The stream is about 55 miles long and drains an area of approximately 560 square miles above the mouth. A large portion of its course forms the boundary between Erie and Chautauqua counties. Its headwaters rise at an elevation of between 1,900 to 2,000 feet. The drainage basin is hilly, fairly well timbered and rather narrow. There are few tributary streams, those of most importance entering the river from the south.

South branch of Cattaraugus creek, which is the largest tributary, enters at a point about two miles above Gowanda. There is a dam at Gowanda which is used for developing electric power and also for running a local grist mill.

Tonawanda Creek

Tonawanda creek rises in Wyoming county and flows northward into Genesee county. At Batavia it turns abruptly to the west and continues in that direction until it reaches the Niagara river at Tonawanda. After passing out of Genesee county it forms the boundary between Niagara county and Erie county. Tonawanda creek rises in a rather hilly country and, in the upper part of its basin, flows through a rather narrow valley.

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[1] Above junction near international boundary.
Above New York State line.
[3] The only tributaries described are those for which records are presented.

Its main tributary is Little Tonawanda creek, which flows into the stream from the right about 3 miles south of Batavia. A good storage reservoir site with a capacity of 9,100,000,000 gallons on this stream at Linden is being investigated by the State of New York Conservation Commission, with a view to installing a water supply for the Orleans Water Supply District, including Batavia, Tonawanda, Brockport, Albion, Middleport and 56 other towns and villages in Genesee, Orleans and Monroe counties. The Conservation Commission has issued a pamphlet descriptive of this project, free copies of which may be obtained by writing to this Commission at Albany.

Genesee River

Genesee river rises in Potter county, Pa., 8 or 10 miles south of the New York-Pennsylvania boundary, flows northwestward for about 32 miles by general course, then turns to the northeast, and empties into Lake Ontario, 7 miles north of Rochester. The entire length of the stream, following bends, is about 135 miles, and the drainage area is about 2,450 square miles.

In the 39 miles between Belmont, in central Allegheny county, and Portage, in southwestern Livingston county, the fall of the water-surface is 253 feet, an average of 6.4 feet per mile. At Portage the river plunges down in three magnificent falls, and thence nearly to Mount Morris flows at the bottom of a deep gorge. From Mount Morris to Rochester the valley is broad and open and the stream is bordered by meadows subject to occasional overflow. At Rochester there is another abrupt descent over three heavy falls, amounting to about 260 feet within the city.

In the northern counties the surface is rolling, with long, easy slopes, except along the streams, which usually lie in deep ravines, hemmed in by steep banks. On the whole there is a gradual rise away from the lakes, and in the upper half of the basin the country becomes rough and is broken by ridges, the summits of which attain elevations of from 2,000 to 2,500 feet above tide.

Precipitation is rather low, the average rainfall being about 35 inches, some 14 inches smaller than that of the upper Sacandaga. Possibilities for storage are great, and the State of New York Conservation Commission proposes a high concrete dam, in the vicinity of Portage, which will store about 19,000,000,000 cubic feet of water, 13,400,000,000 cubic feet of which will be available for commercial use. This reservoir would have a water surface of about 13.5 square miles, and would control a flow equal to the greatest recorded, that of 1865. In addition to this high degree of river control the reservoir could be used to develop electric horsepower at Portage to the extent of 75,000 horsepower, peak load, and at the same time allow the mills at Rochester to run the entire year.

Owasco Outlet

Owasco lake is one of the Finger lake group in central New York and is generally rated as the sixth in size. It is about 11 miles long and has a maximum width of 1.25 miles. It has a water surface area of approximately 12.4 square miles and is drained by Owasco outlet.

The lake extends in a north and south direction and lies wholly within the boundaries of Cayuga county. The southern half of the lake, on both the east and west sides, is flanked by steep, sloping hills, rising to elevations of 500 to 800 feet above the lake surface, which is at an elevation of 710 feet above tide water. These hills are rather deeply indented by numerous small streams that enter the lake at almost right angles from either side. To the south of the head of the lake and extending for some 17 or 18 miles is a rather narrow valley, the floor of which is about one-half mile wide at the lake and narrows up as it approaches the southern extremity. This valley is drained by Owasco inlet which rises near Freeville in Tompkins county.

The dividing line for the drainage basin is at an elevation of from 700 to 1,300 feet above sea level on the west and attains an altitude of some 1,600 feet on the east. The western line falls about 2 miles back from the lake, the eastern divide extends some 7 or 8 miles. The general shape of the drainage basin is long and narrow, the northern end terminating on the shores of Seneca river, into which the waters drain.

Owasco lake occupies about the center of the drainage basin north and south. From the foot of the lake north the descent is very rapid, there being 325 feet fall in the 17 miles between the outlet and Seneca river. One hundred and ten feet of this fall is practically within the city limits of Auburn and is utilized by the numerous manufacturing interests in that city. From a point just above Throopsville to Port Byron, a distance of about 5 miles, there is a fall of 130 feet, very little of which is developed. A State dam about one mile below the outlet of the lake practically controls the low and medium flow of this drainage basin. At Port Byron there is a small diverting dam owned by the State for the purpose of supplying water to the Erie canal. The city of Auburn derives its water supply from Owasco lake and diverts an average of about 6,500,000 gallons daily. The drainage area is representative of the farming district in central New York and is fairly well timbered.

Salmon River

Salmon river rises in the southwestern part of Lewis county, N. Y., and flows southward and then northward, entering Lake Ontario near Port Ontario. Its drainage area comprises about 285 square miles. The topography is generally rolling in character, and the soil is sandy, rock lying near the surface in the upper part of the basin, where there are extensive tracts of virgin forest.

The mean annual precipitation is presumably in excess of 40 inches. Records from 9 stations favorably situated above Pulaski give an average of 60.7 inches for 1912 and 53.6 for 1913.

The basin affords several opportunities for storage and power developments. The Ontario Power Co. has constructed a dam just below the Stillwater highway bridge creating a large storage reservoir, and utilizing the natural fall of 110 feet at High Falls a net operating head of 255 feet has been developed. One or two other developments further down the river will be made possible by the increased storage from this reservoir.

A gaging station has been maintained in this river basin near Pulaski from 1900 to 1908 and from 1910 to 1913 inclusive, and at Stillwater near Altmar in 1911, 1912 and 1913.

Black River

Black river rises in the western part of Hamilton county, N. Y., flows southwestward across Herkimer county into Oneida county, turns near Forestport and runs somewhat west of north through Lewis county to eastern Jefferson county, and then flows westward to Black River bay, at the eastern extremity of Lake Ontario. Its total drainage area is 1,930 square miles. The upper part of the basin is very rugged and mountainous, contains a large number of lakes, and is in a part of the Adirondack forest.

The mean annual precipitation is about 40 inches, ranging from 55 inches in the extreme headwaters to perhaps 30 inches near Lake Ontario. The winters are generally quite severe, and the stream flow is affected by ice for periods of several months.

The regimen of the river is controlled by storage on its upper tributaries (including Beaver river at Beaver), a series of reservoirs at the headwaters of Moose river, and additional reservoirs at Forestport and on the headwaters of the main river.

Water is diverted from Black river through Forestport feeder to supply the Black River canal at Boonville. A portion of this diverted water flows northward from Boonville and enters Black river again at Lyons Falls; the remainder flows southward through the Black River canal and enters the Erie canal at Rome.

STREAMS TRIBUTARY TO THE ST. LAWRENCE BELOW LAKE ONTARIO

Oswegatchie River

Oswegatchie river rises in Cranberry lake and the mountains to the southwest in St. Lawrence and Jefferson counties, whence it flows in a general northly direction into the St. Lawrence river at Ogdensburg, where its drainage area is 1,609 square miles. The river is formed by the junction of the east branch of Oswegatchie river and the south branch of the Oswegatchie river at Dodgeville, and its main tributary below this point is Indian river, which flows through Black lake. Considerable power is developed along all three of these main tributaries and many of the power sites in the lower reaches of the river have also been developed.

On the east branch of Oswegatchie river there are two important storage sites, one at Cranberry Lake and the other at Newton Falls.

A detailed report of the opportunities for power development in this drainage basin is published in the Third Annual Report of the New York State Conservation Commission.

Raquette River

Raquette river rises in northern Hamilton county, flows almost north through a long narrow valley to St. Lawrence river. Its total length from its source to its confluence with the St. Lawrence, near the most northern point of the State, is 162 miles. The drainage area at the mouth of the river is 1,269 square miles.

Its source is on an elevated plateau about 1,600 feet above sea level. The upper part of the basin includes many acres of swamp land, as well as a large area of lakes and ponds, including Tupper lake, Little Tupper lake, Long lake, Round lake, Blue Mountain lake, Forked lake and Raquette lake.

The high region receives a heavy rainfall, the mean annual amounting to about forty-eight inches, or about ten inches above the mean for the State.

The course of the river through the mountains is marked by many falls and rapids, but as yet only 400 feet of the 1,400 feet of fall in the river below Tupper lake has been developed. The river is characterized by tremendous fluctuations between the maximum and minimum flow and is in great need of artificial regulation if the possibilities of power development are to be fully realized. The State of New York Conservation Commission has under consideration extensive storage projects on this stream which, when completed, will materially benefit the existing powers and tend to make the undeveloped portions of greater economic importance.

St. Regis River

St. Regis river has its source in several small streams and lakes in the western part of Franklin county at an elevation of about 1,500 feet above the sea. It first flows in a northwesterly direction for about 40 miles and then somewhat east of north for about 28 miles to its mouth, in the St. Lawrence river near the State line. Its drainage area comprises 664 square miles (State Water Supply Commission).

The upper portion of its basin shed consists of swamp and of mountains from which most of the forest has been cut. Upon leaving the plateau the stream descends for 10 or 15 miles through a rugged country by a succession of steep rapids and precipitous falls to the low lands bordering the St. Lawrence. Only a few of the excellent opportunities for developing power in the descent have as yet been utilized. From the foot of the hills to the St. Lawrence, the slope of the river is moderate and rock out-crop not frequent, consequently favorable sites for power plants are scarce. According to report of the State Water Supply Commission for 1910, the present limit of profitable development through this low country, except as increased by regulation of stream flow, has probably been reached in the existing plants. A detailed account of the developed and undeveloped power sites is given in the 1910 report of the State Water Supply Commission.

Richelieu River

Richelieu river, the outlet of Lake Champlain, emerges from the lake at Rouses Point and flows northward to the St. Lawrence.

Lake Champlain occupies a long and narrow valley, extending in a north-south direction and forming a part of the boundary between New York and Vermont. The elevation of the lake is about 95 feet above tide, and the water-surface area is 436 square miles.

The drainage basin is irregular in form, being about 75 miles wide from a point opposite Middlebury, Vt., northward to the outlet of the lake at Rouses Point, on the international boundary. South of Middlebury the average width of the basin is about 35 miles, and the lake itself is very narrow, forming virtually a drowned river.

The tributary region is rugged and mountainous, covered with little depth of soil except in the stream valleys. The drainage is received almost entirely through large tributaries, there being little direct coast drainage into the lake. The total drainage area at the mouth of the lake is about 7,867 square miles (including lake surface).

The only river flowing into Lake Champlain that need be described in this connection is the Ausable.

Ausable river is formed by the junction of the east and west branches which have their headwaters in the northwestern part of Essex county. The east branch flows from upper Ausable lake, at an elevation of 1,990 feet above sea level. The west branch is formed by several small streams that lie in the valley to the west and north of the east branch. Both branches flow north and east to their junction at the village of Ausable Forks, from which point the river flows northeast, entering Lake Champlain about 10 miles south of Plattsburg and opposite and slightly north of the city of Burlington, Vt.

Throughout the entire course, the river is fed by small mountain streams that enter at nearly right angles from the mountains on either side. There are few lakes in this drainage area to act as regulators of the flow and, owing to the great differences of elevation throughout the area, the stream has what is called a flashy discharge, its fluctuations being large and rapid.

Owing to the fact that this basin lies on the eastern slope of the Adirondack mountains, the average rainfall is less than for those basins whose streams rise on the western and southern slopes, the mean yearly precipitation being about 32 inches.

STATION RECORDS

CATTARAUGUS CREEK AT VERSAILLES, N. Y.

Location.— On a three-span highway bridge in the village of Versailles, about 6 miles below Gowanda, 2¼ miles above the mouth of Clear creek (coming in from the right), and about 8 miles above the mouth of the stream.

Records available.— September 23, 1910, to September 30, 1914.

Drainage area.— 467 square miles. (Measured on Post Route Map.)

Gage.— Chain, fastened to the upstream side of the first span from the right-hand end of the bridge; read twice daily to quarter tenths at about 9 A. M. and 6 P. M., datum unchanged.

Control.— Rock and gravel; occasionally shifting.

Discharge measurements.— Made from the downstream side of the bridge.

Winter flow.— Relation of gage height to discharge affected by ice.

Gage observations suspended during this period.

Accuracy.— Discharge curve well defined. Estimates as published, fairly good.

Discharge measurements of Cattaraugus Creek at Versailles, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 31	R. S. Barnes	5.19	287
1914			
Mar. 31	C. S. De Golyer	6.61	2,350
Aug. 22a	do	5.26	318
22b	do	5.21	277
Sept. 30c	E. D. Burchard	4.92	129
30d	do	4.94	143

a Measurement made by wading 75 feet below gage.
b Measurement made by wading 150 feet below gage.
c Measurement made by wading 300 feet below gage.
d Measurement made by wading 300 feet above gage.

Daily gage height, in feet, of Cattaraugus Creek at Versailles, N. Y., for the year ending September 30, 1914

[James Palmer, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	4.85	5.2	5.12	5.18	6.25	......	6.25	5.48	5.3	4.98	4.8	5.25
2.....	4.9	5.22	5.12	5.18	5.95	......	7.2	5.38	5.22	5.0	4.82	6.15
3.....	5.08	5.22	5.12	5.2	5.77	......	6.7	5.32	5.2	5.0	4.8	5.65
4.....	5.0	5.25	5.12	5.26	6.25	......	6.3	5.32	5.4	4.95	4.8	5.85
5.....	4.95	5.2	5.12	5.18	6.1	......	6.1	6.45	5.58	4.92	4.82	5.55
6.....	4.95	5.12	5.12	5.22	5.85	......	5.98	6.75	5.32	4.9	4.8	5.28
7.....	4.82	5.05	5.12	5.22	5.3	5.78	6.05	6.0	5.28	4.88	4.8	5.2
8.....	4.85	5.0	5.2	5.26	5.2	......	7.6	5.35	5.2	4.9	4.72	5.12
9.....	4.85	5.35	5.12	5.38	5.37	......	6.4	7.8	5.18	4.85	4.75	5.1
10.....	4.82	6.3	5.15	5.78	5.6	......	6.2	7.6	5.12	4.82	4.8	5.02
11.....	4.85	5.65	5.12	5.45	5.6	......	6.4	7.8	5.08	4.8	5.02	5.02
12.....	5.0	5.52	5.08	5.2	5.55	......	6.6	8.2	5.1	4.8	4.92	5.02
13.....	5.05	6.1	5.18	5.17	5.5	......	6.2	7.8	5.05	4.88	4.85	5.02
14.....	4.95	6.1	5.25	5.55	5.57	......	5.98	6.5	5.05	4.92	4.88	4.98
15.....	4.95	5.78	5.25	5.83	5.7	......	5.9	6.1	5.02	4.95	4.9	4.95
16.....	4.9	5.5	5.28	5.8	5.67	7.4	6.45	5.82	5.02	4.92	4.88	5.02
17.....	4.85	5.4	5.22	5.77	5.67	7.0	6.2	5.68	5.0	4.85	4.9	4.98
18.....	4.9	5.35	5.18	5.73	5.63	6.8	5.82	5.58	5.0	4.88	4.98	4.92
19.....	4.95	5.38	5.18	5.65	5.63	6.3	5.85	5.52	5.02	4.9	5.5	4.92
20.....	5.15	6.1	5.18	5.73	5.6	6.1	5.8	5.42	5.12	4.9	5.12	4.92
21.....	5.25	6.1	5.16	5.83	5.55	5.92	5.82	5.4	5.05	4.88	5.25	4.92
22.....	5.35	5.5	5.18	5.87	5.6	5.6	5.82	5.35	5.05	4.8	5.1	4.92
23.....	5.42	5.32	5.28	5.83	5.63	5.52	5.88	5.38	5.0	4.8	5.1	4.9
24.....	5.52	5.25	5.52	6.45	5.57	5.52	5.82	5.35	5.0	4.92	6.4	4.92
25.....	5.60	5.2	5.48	5.33	5.6	6.05	5.85	5.3	5.0	4.82	5.9	5.08
26.....	5.48	5.18	5.35	5.3	......	8.4	5.98	5.3	4.95	4.8	5.4	4.98
27.....	5.32	5.18	5.25	5.37	......	8.7	5.85	5.32	4.92	4.85	5.15	4.88
28.....	5.2	5.2	5.18	8.0	......	9.1	5.58	5.4	4.98	4.8	5.32	4.82
29.....	5.18	5.15	5.25	7.4	......	7.0	5.58	5.3	5.0	4.82	5.42	4.9
30.....	5.2	5.12	5.18	7.2	......	6.8	5.55	6.1	5.02	4.8	5.45	4.9
31.....	5.18	......	5.18	6.75	......	6.4	......	5.55	......	4.82	5.25	......

NOTE.— Discharge relation affected by ice January 14 to 27, and February 9 to March 15, inclusive.

Daily discharge, in second-feet, of Cattaraugus Creek at Versailles, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	118	300	248	277	1,600	......	1,600	515	350	157	90	315
2.....	135	315	248	277	1,110	......	3,980	418	294	165	97	1,260
3.....	224	315	248	300	862	......	2,570	367	280	165	90	700
4.....	180	338	248	345	1,600	......	1,700	367	435	145	90	960
5.....	158	300	248	277	1,340	......	1,340	2,000	619	133	97	538
6.....	158	248	248	315	968	......	1,150	2,700	367	125	90	336
7.....	107	208	248	315	375	......	1,260	1,180	336	117	90	280
8.....	118	180	300	345	300	......	5,320	392	280	125	66	232
9.....	118	418	248	443	......	......	1,900	6,050	268	108	75	220
10.....	107	1,700	268	875	......	......	1,510	5,320	232	97	90	176
11.....	118	718	248	508	......	......	1,900	6,050	209	90	176	176
12.....	180	576	224	300	......	......	2,330	7,640	220	90	133	176
13.....	208	1,340	287	280	......	......	1,510	6,030	192	117	108	176
14.....	158	1,340	338	......	......	......	1,150	2,110	192	133	118	157
15.....	158	875	338	......	......	......	1,030	1,340	176	145	125	145
16.....	135	555	360	......	......	4,630	2,000	918	176	133	118	176
17.....	118	460	315	......	......	3,370	1,510	736	165	108	125	157
18.....	135	418	287	......	......	2,820	918	619	165	117	157	133
19.....	158	443	287	......	......	1,700	960	556	176	125	535	133
20.....	268	1,340	287	......	......	1,340	890	455	232	125	232	133

Daily discharge, in second-feet, of Cattaraugus Creek at Versailles, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
21	338	1,340	287	......	......	1,060	918	435	192	117	315	133
22	418	555	287	......	......	660	918	392	192	90	220	133
23	479	392	360	......	......	576	1,000	418	165	90	220	125
24	576	338	576	......	......	576	918	392	165	133	1,900	133
25	660	300	536	......	......	1,260	960	350	165	97	1,030	209
26	536	287	418	......	......	8,440	1,150	350	145	90	435	157
27	392	287	338	......	......	9,640	960	367	133	108	250	118
28	300	300	287	8,640	......	11,200	619	435	157	90	367	97
29	287	268	338	4,630	......	3,370	619	350	165	97	455	125
30	300	248	287	3,980	......	2,820	588	1,340	176	90	485	125
31	287	......	287	2,700	......	1,900	......	588	......	97	315	......

NOTE.— Daily discharge determined from a rating curve that was well defined below 4,500 second-feet.

Monthly discharge of Cattaraugus Creek at Versailles, N. Y., for the year ending September 30, 1914

[Drainage area, 467 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	660	107	246	0.53	0.61	B
November	1,700	180	557	1.19	1.33	B
December	576	224	307	.66	.76	B
January	8,640	....	903	1.93	2.23	B
February	1,600	....	441	.944	.98	C
March	11,200	....	1,870	4.00	4.61	B
April	5,320	588	1,510	3.23	3.60	A
May	7,640	350	1,650	3.53	4.07	A
June	619	133	234	.501	.56	B
July	165	90	117	.251	.29	B
August	1,900	66	280	.600	.69	B
September	1,260	97	266	.570	.64	B
The year	11,200	66	701	1.50	20.37	.....

NOTE.— Mean discharge, estimated by comparison with records on Genesee River and Little Tonawanda Creek, as follows: January 14 to 27, 227 second-feet; February 9 to 28, 210 second-feet; March 1 to 15, 171 second-feet.

LITTLE TONAWANDA CREEK AT LINDEN, N. Y.

Location.— At the stone arch highway bridge in the village of Linden, 600 feet northeast of Erie Railroad station, and 3 miles above junction with Tonawanda creek.

Records available.— July 8, 1912, to September 30, 1914.

Drainage area.— 22.0 square miles. (Measured on topographic sheets of United States Geological Survey.)

Gage.— Vertical staff on right-hand upstream abutment of bridge; lower 2 feet of enameled iron graduated to hundredths of a foot; upper 4 feet of bronze graduated to half-tenths. Gage read daily, morning and evening, to half-tenths.

Control.— A standard Francis weir has been constructed under the upstream side of the bridge, having a length of 2.01 feet and a height of 8 inches. When the water overtops this weir it flows over a 2-inch plank about 13 feet long, including the 2 feet of weir. The weir was carried away by a floating tree on March 25, 1913, and was duplicated June 20, 1913.

Discharge measurements.— High-water measurements made from a cable and car 1,000 feet above weir; low-water measurements made by wading above weir.

Accuracy.— At gage height 0.69, or below, flow is confined to weir. During such stages the accuracy of the data will be the accuracy of a properly constructed Francis weir. For stages above gage height 0.69, weir has been rated with a current meter, and data for such stages should also be excellent. Good rating curve of weir in its damaged condition obtained by current meter measurements.

Discharge measurements of Little Tonawanda Creek at Linden, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Aug. 6[a]......	C. H. Pierce..	0.27	0.89
21[b]......	C. S. De Golyer..	.66	3.14
21[c]......	do	.792	5.57

[a] Measurement made by wading 200 feet below gage.
[b] Measurement made by wading 300 feet above gage.
[c] Measurement made by wading 350 feet above gage.

Daily gage height, in feet, of Little Tonawanda Creek at Linden, N. Y., for the year ending September 30, 1914
[C. L. Schenck, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	0.22	0.27	0.73	0.78	1.46	0.90	2.1	1.15	0.82	0.50	0.29	0.75
2.....	.22	.26	.71	.76	1.33	.76	3.8	1.08	.80	.64	.30	1.16
3.....	.21	.27	.72	.76	1.32	.88	2.5	1.02	.76	.76	.32	.93
4.....	.21	.28	.72	.78	2.0	.86	1.8	1.00	1.00	.60	.28	1.42
5.....	.20	.26	.71	.78	1.47	.88	1.7	3.5	.93	.54	.26	.99
6.....	.20	.26	.69	.81	1.34	.86	1.55	3.1	.84	.50	.28	.88
7.....	.20	.26	.72	.80	1.31	.87	1.75	1.7	.82	.48	.28	.83
8.....	.18	.26	.80	.82	.95	.86	3.5	1.55	.80	.46	.24	.80
9.....	.18	.59	.72	.88	1.03	.84	2.1	2.7	.76	.45	.23	.74
10.....	.20	.90	.73	1.03	1.05	.84	2.15	1.65	.73	.44	.26	.72
11.....	.23	.72	.69	1.00	1.01	.84	2.9	1.5	.71	.42	.28	.71
12.....	.24	.60	.72	.94	.97	.85	2.3	2.1	.69	.41	.26	.70
13.....	.21	.64	.80	.93	.93	.84	1.8	3.2	.65	.42	.26	.66
14.....	.20	.73	.87	.94	.92	.88	1.65	2.05	.63	.42	.29	.62
15.....	.20	.72	.84	.90	.92	1.14	1.6	1.55	.61	.43	.26	.59
16.....	.21	.66	.79	.90	.92	2.35	2.7	1.40	.62	.42	.24	.56
17.....	.21	.64	.79	.94	.91	3.5	1.8	1.28	.58	.42	.25	.54
18.....	.22	.62	.78	.92	.91	2.5	1.6	1.20	.56	.43	.28	.53
19.....	.22	.70	.74	.92	.91	1.6	1.55	1.14	.66	.35	.70	.52
20.....	.32	1.16	.72	.92	.89	1.65	1.48	1.08	.71	.34	.60	.50
21.....	.27	.94	.71	.92	.88	1.65	1.41	1.04	.65	.32	.75	.49
22.....	.23	.89	.70	.92	.88	1.55	1.32	1.00	.62	.32	.77	.48
23.....	.22	.86	.74	.90	.88	1.44	1.21	1.02	.83	.36	.54	.47
24.....	.27	.84	.82	.99	.86	1.40	1.14	.96	.64	.40	1.74	.52
25.....	.33	.85	.86	1.04	.84	1.95	1.16	.92	.55	.34	.94	.50
26.....	.32	.82	.79	1.09	.84	5.8	1.42	.90	.52	.32	.78	.47
27.....	.30	.80	.74	1.1	.84	5.4	1.30	1.02	.54	.36	.71	.50
28.....	.28	.76	.79	2.05	.86	4.9	1.22	.92	.55	.34	.64	.46
29.....	.26	.74	.75	4.0	......	3.1	1.21	.88	.52	.32	.92	.46
30.....	.29	.74	.79	3.4	......	3.2	1.28	.94	.53	.31	.98	.48
31.....	.28	......	.80	1.75	......	2.45	......	.86	......	.30	.82	......

NOTE.— The crest of the weir was kept free of ice during the winter, maintaining a constant discharge relation.

Daily discharge, in second-feet, of Little Tonawanda Creek at Linden, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	0.59	0.82	4.1	5.1	40.	8.4	91.	19.	6.1	2.12	0.91	4.4
2	.59	.77	3.7	4.6	30.	4.6	274.	15.	5.6	3.07	.96	19.1
3	.55	.82	3.9	4.6	29.	7.8	126.	13.	4.6	4.6	1.07	9.4
4	.55	.87	3.9	5.1	83.	7.2	67.	12.	12.	2.79	.87	36.6
5	.51	.77	3.7	5.1	41.	7.8	59.	235.	9.4	2.38	.77	11.8
6	.51	.77	3.48	5.9	30.	7.2	47.	187.	6.6	2.12	.87	7.8
7	.51	.77	3.9	5.6	28.	7.5	63.	59.	6.1	1.99	.87	6.4
8	.43	.77	5.6	6.1	10.	7.2	235.	47.	5.6	1.87	.68	5.6
9	.43	2.72	3.9	7.8	13.	6.6	91.	144.	4.6	1.81	.63	4.2
10	.51	8.4	4.1	13.	14.	6.6	95.	55.	4.1	1.74	.77	3.9
11	.63	3.9	3.48	12.	12.	6.6	164.	43.	3.7	1.62	.87	3.7
12	.68	2.79	3.9	9.7	11.	6.9	108.	91.	3.48	1.56	.77	3.60
13	.55	3.07	5.6	9.4	9.4	6.6	67.	199.	3.14	1.62	.77	3.21
14	.51	4.1	7.5	9.7	9.0	7.8	55.	87.	3.00	1.62	.91	2.93
15	.51	3.9	6.6	8.4	9.0	18.	51.	47.	2.86	1.68	.77	2.72
16	.55	3.21	5.3	8.4	9.0	112.	144.	35.	2.93	1.62	.68	2.51
17	.55	3.07	5.3	9.7	8.7	235.	67.	26.	2.65	1.62	.72	2.38
18	.59	2.93	5.1	9.0	8.7	126.	51.	21.	2.51	1.68	.87	2.32
19	.59	3.6	4.2	9.0	8.7	51.	47.	18.	3.21	1.23	3.6	2.25
20	1.07	19.1	3.9	9.0	8.1	55.	41.	15.	3.7	1.17	2.79	2.12
21	.82	9.7	3.7	9.0	7.8	55.	36.	13.	3.14	1.07	4.4	2.05
22	.63	8.1	3.6	9.0	7.8	47.	29.	12.	2.93	1.07	4.9	1.99
23	.59	7.2	4.2	8.4	7.8	38.	22.	13.	6.4	1.28	2.38	1.93
24	.82	6.6	6.1	11.	7.2	35.	18.	10.	3.07	1.51	62.	2.25
25	1.12	6.9	7.2	14.	6.6	79.	19.	9.	2.45	1.17	9.7	2.12
26	1.07	6.1	5.3	16.	6.6	584.	37.	8.4	2.25	1.07	5.1	1.93
27	.96	5.6	4.2	16.	6.6	516.	28.	13.	2.38	1.28	3.7	2.12
28	.87	4.6	5.3	87.	7.2	436.	22.	9.0	2.45	1.17	3.07	1.87
29	.77	4.2	4.4	302.	......	187.	22.	7.8	2.25	1.07	9.0	1.87
30	.91	4.2	5.3	223.	......	199.	26.	9.7	2.32	1.01	11.1	1.99
31	.87	......	5.6	63.	......	122.	......	7.2	......	.96	6.1	......

NOTE.— Daily discharge determined from well-defined rating curve.

Monthly discharge of Little Tonawanda Creek at Linden, N. Y., for the year ending September 30, 1914

[Drainage area, 22.0 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1.12	0.43	0.67	0.031	0.04	A
November	19.1	.77	4.34	.197	.22	A
December	7.5	3.48	4.71	.214	.25	A
January	302.0	4.6	29.5	1.34	1.54	A
February	83.0	6.6	16.8	.764	.8	A
March	584.0	4.6	96.6	4.39	5.06	A
April	235.0	18.0	73.4	3.34	3.73	A
May	235.0	7.2	47.7	2.17	2.5	A
June	12.0	2.25	4.18	.19	.21	A
July	4.6	.96	1.69	.077	.09	A
August	62.0	.63	4.6	.209	.24	A
September	36.6	1.87	5.23	.238	.26	A
The year	584.0	0.43	24.2	10.1	14.94	......

GENESEE RIVER AT ST. HELENA, N. Y.

Location.— At the steel highway bridge about 6 miles above the mouth of Silver Lake outlet (coming in from the left), 9½ miles above Canaseraga creek (coming in from the right), and 5½ miles below the village of Portageville and the site of the proposed storage dam of the State of New York Conservation Commission.

Records available.— August 14, 1908, to September 30, 1914.

Drainage area.— 1,030 square miles. (From United States Geological Survey water supply papers.)

Gage.— Chain, fastened to the upstream side of the bridge, middle span; read at about 7 A. M. and 6 P. M. daily to hundredths. Since August 24, 1911, an automatic recording gage, with intake pipe to the well a few feet downstream from the chain gage. In September, 1914, the intake pipe was extended about 27 feet to the first bridge pier from the left bank. Datum same as chain gage, but slope of water surface makes readings different. Gage heights from recording gage used to hundredths.

Control.— Gravel and rocks; occasionally shifting.

Discharge measurements.— At high stages made from the bridge; at low and medium stages made either by wading or from the bridge.

Winter flow.— Relation between gage height and discharge usually but slightly affected by ice; determination of winter discharge considered good when frequent discharge measurements are made.

Accuracy.— Discharge rating curve well defined. Conditions for meter measurements good. Gage heights from automatic gage eliminate error from diurnal fluctuations in flow due to operation of mill above the station.

Discharge measurements of Genesee River at St. Helena, N. Y., during the year ending September 30, 1914

DATE	Made by	GAGE HEIGHT Chain	GAGE HEIGHT Automatic	Discharge
1913		*Feet*	*Feet*	*Sec.-ft.*
Oct. 30	R. S. Barnes	2.95	2.93	487
1914				
Jan. 10	W. S. Easterly	3.00	2.92	544
28[a]	do	3.63	3.58	985
Feb. 14	C. S. De Golyer	2.82	2.80	389
Mar. 6[b]	C. C. Covert	3.92	....	258
18	C. S. De Golyer	6.00	....	5.450
19	do	4.62	....	2,310
19	do	4.55	....	2,310
29	do	8.88	....	16,800
29	do	7.69	....	11,200
30	do	6.98	....	8,300
June 8[c]	do	3.10	3.06	520
9[d]	do	3.08	3.06	530
Aug. 6[e]	C. H. Pierce	....	2.07	85
6[f]	do	....	2.07	83
20[g]	C. S. De Golyer	2.72	2.68	285
25	do	3.83	3.78	1,220
Sept. 21[h]	E. D. Burchard	2.31	2.28	134
25[i]	do	2.47	2.43	176
25[i]	do	2.42	2.37	151
26[h]	do	2.20	2.15	102

[a] Backwater from ice. Measurement made from bridge and through ice.
[b] Backwater from ice. Measurement made through ice 400 feet below bridge.
[c] Measurement made by wrding 200 feet below gage.
[d] Measurement made by wading 100 feet below gage.
[e] Measurement made by wading 60 feet above gage.
[f] Measurement made by wading 45 feet above bridge.
[g] Measurement made by wading 150 feet below gage.
[h] Measurement made by wading opposite gage.
[i] Measurement made by wading one-quarter mile above gage

Daily gage height, in feet, of Genesee River at St. Helena, N. Y., for the year ending September 30, 1914

[Herman Piper, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	2.02	2.75	2.81	2.72	6.32	4.1	5.8	3.55	3.0	2.46	2.28	2.63
2.....	2.00	2.67	2.76	2.75	4.95	3.96	6.9	3.4	2.86	2.44	2.06	4.18
3.....	2.20	2.62	2.73	2.58	4.68	3.82	5.7	3.3	2.78	2.29	2.31	4.94
4.....	2.18	2.68	2.72	2.58	5.8	3.88	5.2	3.25	3.25	2.32	1.92	4.07
5.....	1.72	2.56	2.70	2.68	5.05	3.78	4.8	4.2	3.4	2.15	2.20	3.65
6.....	2.19	2.51	2.66	2.76	4.3	3.58	4.6	7.3	3.1	2.35	2.10	3.22
7.....	2.16	2.48	2.66	2.66	4.15	3.4	4.4	5.4	2.88	2.28	2.13	3.00
8.....	2.05	2.45	2.73	2.72	3.78	3.65	7.7	4.9	3.0	2.28	2.13	2.83
9.....	1.85	2.72	2.75	2.76	3.25	3.55	6.2	7.0	3.1	2.08	2.15	2.71
10.....	2.12	5.45	2.71	2.98	3.2	3.6	5.5	5.8	2.84	2.28	2.15	2.62
11.....	1.96	4.20	2.77	3.27	3.15	3.68	5.8	5.0	2.69	2.05	2.25	2.55
12.....	2.26	3.65	2.77	3.26	3.08	3.58	5.9	6.0	2.63	2.16	2.20	2.51
13.....	2.40	3.46	2.75	3.02	3.02	3.62	5.1	9.3	2.58	2.28	2.15	2.43
14.....	2.11	3.77	2.78	3.11	2.82	3.55	4.7	6.9	2.50	2.09	2.15	2.46
15.....	2.02	3.93	2.91	3.12	2.92	3.7	4.6	5.6	2.52	2.20	2.14	2.40
16.....	2.09	3.63	2.90	3.26	2.95	4.05	6.9	5.0	2.46	2.31	2.12	2.34
17.....	1.96	3.47	2.79	3.18	2.98	6.4	5.7	4.6	2.43	2.04	2.10	2.31
18.....	2.15	3.39	2.74	3.05	2.91	6.3	5.0	4.3	2.40	2.22	2.16	2.20
19.....	1.81	3.29	2.70	2.95	2.92	4.8	4.7	4.15	2.42	2.14	2.40	2.24
20.....	2.35	3.53	2.56	3.11	2.82	4.3	4.35	3.85	2.56	2.29	2.75	2.23
21.....	2.46	3.52	2.62	2.98	4.7	4.0	4.5	3.65	2.46	2.15	3.80	2.25
22.....	2.61	3.36	2.62	2.96	4.35	3.9	4.3	3.5	2.52	2.09	3.64	2.23
23.....	2.62	3.19	2.65	3.2	4.28	3.7	4.2	3.45	2.48	2.16	3.10	2.17
24.....	2.40	3.12	2.73	3.26	3.95	3.6	3.9	3.3	2.38	2.25	3.57	2.22
25.....	2.59	3.06	3.06	3.21	4.1	3.9	3.7	3.25	2.38	2.32	3.81	2.23
26.....	2.70	2.99	2.91	3.32	3.92	7.4	3.9	3.2	2.45	2.21	3.19	2.23
27.....	3.64	2.93	2.73	3.48	3.88	8.6	4.15	3.45	2.54	2.31	2.86	2.17
28.....	3.18	2.87	2.74	3.70	3.82	3.9	3.9	3.7	2.36	2.32	2.70	2.31
29.....	2.89	2.82	2.78	6.09	......	8.3	3.7	3.5	2.42	2.19	2.70	2.19
30.....	2.82	2.80	2.82	7.73	......	7.1	3.7	3.4	2.41	2.20	2.71	2.25
31.....	2.82	......	2.87	6.18	......	6.8	......	3.2	......	1.95	2.73	......

NOTE.— Gage height from chain gage during the following periods: October 1 to 23; December 28; January 10, 15, 27, 31; June 9 to August 6. Gage heights from the automatic gage for the remainder of the year. The intake pipe of the automatic gage well was covered with gravel January 31 to June 9, rendering the automatic record valueless. Discharge relation affected by ice January 1 to 28; February 21 to March 16, inclusive. Daily discharge given during these periods is only approximate.

Daily discharge, in second-feet, of Genesee River at St. Helena, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	69	372	408	317	5,940	548	4,920	910	450	176	122	260
2.....	64	327	378	333	2,990	455	8,200	770	362	170	75	1,810
3.....	114	302	360	250	2,450	372	4,670	680	317	125	130	3,290
4.....	109	333	355	250	4,680	406	3,490	638	638	133	50	1,640
5.....	20	273	344	296	2,990	349	2,700	1,720	770	92	102	1,080
6.....	111	249	322	338	1,840	258	2,350	9,630	520	142	82	656
7.....	103	235	322	287	1,710	178	2,020	3,940	373	122	96	485
8.....	76	222	360	317	1,220	282	11,200	2,890	450	122	96	370
9.....	36	355	372	338	666	237	6,000	8,550	520	79	100	300
10.....	92	4,360	349	468	624	258	4,180	4,920	376	122	100	255
11.....	56	1,950	384	773	586	297	4,920	3,080	290	74	122	224
12.....	132	1,180	384	764	548	250	5,180	5,450	260	94	110	206
13.....	178	966	372	556	480	268	3,280	19,000	236	122	100	177
14.....	90	1,330	390	548	372	237	2,520	8,200	202	80	100	188
15.....	69	1,550	474	514	430	306	2,350	4,420	211	102	98	166

Daily discharge, in second-feet, of Genesee River at St. Helena, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
16.....	85	1,160	467	624	449	514	8,200	3,080	188	130	94	147
17.....	56	977	396	586	469	6,590	4,670	2,350	177	72	90	138
18.....	100	890	366	480	424	6,290	3,080	1,870	166	107	102	110
19.....	29	791	344	418	430	2,700	2,520	1,650	173	90	166	120
20.....	161	1,040	273	514	372	1,870	1,950	1,250	213	124	322	118
21.....	201	1,030	302	437	360	1,440	2,180	1,020	176	92	1,250	122
22.....	263	860	302	424	480	1,310	1,870	860	198	80	1,060	118
23.....	268	701	317	586	480	1,070	1,720	815	183	94	560	104
24.....	200	638	360	624	449	960	1,310	680	150	114	987	115
25.....	287	588	588	586	548	1,310	1,070	638	150	133	1,260	118
26.....	344	532	474	666	430	10,000	1,310	595	173	104	632	118
27.....	1,170	488	360	850	406	15,400	1,650	815	206	130	389	104
28.....	692	447	328	1,120	372	22,000	1,310	1,070	144	133	295	138
29.....	460	415	349	5,960	......	13,900	1,070	860	163	100	295	108
30.....	415	402	372	10,600	......	8,900	1,070	770	159	102	300	122
31.....	415	......	401	5,680	......	7,860	......	595	......	57	312	......

NOTE.— Daily discharge determined from well-defined rating curve. New rating curve used beginning March 17, 1914.

Monthly discharge of Genesee River at St. Helena, N. Y., for the year ending September 30, 1914
[Drainage area, 1,030 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage areas	
October....................	1,170	20	208	0.202	0.23	A
November..................	4,360	222	832	.808	.90	A
December..................	588	273	373	.362	.42	A
January....................	10,600	250	1,180	1.15	1.33	B
February..................	5,940	360	1,190	1.16	1.21	B
March......................	22,000	178	3,450	3.35	3.86	A
April........................	11,200	1,070	3,430	3.33	3.72	A
May.........................	19,000	595	3,020	2.93	3.38	A
June.........................	770	144	286	.278	.31	B
July..........................	176	57	110	.107	.12	B
August......................	1,260	50	310	.301	.35	A
September.................	3,290	104	430	.417	.47	A
The year...............	22,000	20	1,230	1.19	16.30	......

GENESEE RIVER AT JONES' BRIDGE, NEAR MT. MORRIS, N. Y.

Location.— At the highway bridge known as Jones' bridge, about 5 miles below the village of Mt. Morris, 6 miles by river above the village of Geneseo, 1¾ miles below the inflow of Canaseraga creek (coming in from the right), and about 1¾ miles above the mouth of Beads creek (coming in from the left).

Records available.— May 22, 1903, to April 30, 1906; August 12, 1908, to May 1, 1914.

Drainage area.— 1,410 square miles.

Gage.— Chain, fastened to upstream side of highway bridge; read at about 6 A. M. and 6 P. M. daily to quarter-tenths.

Control.— Sandy clay; liable to shift, but measurements indicate that it has been fairly permanent in recent years.

Discharge measurements.— Made at all stages from foot bridge erected on the outriggers of the bridge.

Winter flow.— Discharge relation affected by ice during the winter months. Gage observations are suspended during this period and the flow determined by comparison with the flow of the Genesee at Rochester and at St. Helena.

Accuracy.— Discharge curve well developed and data as published for open water periods believed to be good.

No discharge measurements made during 1914.

Daily gage height, in feet, of Genesee River near Jones Bridge, Mt. Morris, N. Y., for the yea ending September 30, 1914
[T. S. Trewer, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April
1	3.28	4.7	4.7	....	....	17.6	16	3.75	6.0	4.95	....	....	15.4
2	3.32	4.7	4.7	....	....	17.3	17	3:44	5.8	4.7	....	....	14.6
3	3.3	4.5	4.6	....	....	16.7	18	3.5	5.8	4.6	....	....	11.5
4	3.45	4.4	4.5	....	....	12.7	19	3.48	5.7	4.5	....	....	9.8
5	3.46	4.35	4.5	....	....	10.5	20	3.7	5.6	4.5	....	....	9.3
6	3.5	4.3	4.5	....	....	9.2	21	4.15	5.6	4.5	....	....	8.8
7	3.7	4.35	4.5	5.5	....	8.6	22	4.25	5.7	4.5	....	....	8.2
8	3.7	4.55	4.5	5.4	....	17.0	23	4.35	5.2	4.35	....	....	7.6
9	3.9	5.4	4.6	5.2	....	18.8	24	4.35	5.2	4.35	....	6.5	7.0
10	3.5	11.6	4.5	5.4	....	14.0	25	4.2	5.2	4.9	....	8.4	6.5
11	3.4	8.0	4.6	5.7	....	14.6	26	4.5	4.95	4.8	....	16.3	7.0
12	3.4	7.2	4.65	6.4	....	14.4	27	5.0	4.95	5.8	....	23.8	7.4
13	3.95	6.8	4.7	6.7	....	12.0	28	5.3	4.9	6.3	....	26.3	7.0
14	3.9	6.4	4.65	....	....	9.9	29	5.2	4.8	....	....	26.2	6.6
15	3.8	6.7	4.85	....	....	9.0	30	4.9	4.75	....	....	24.3	6.4
							31	4.7	....	....	....	22.6	....

NOTE.— Discharge relation affected by ice December 27 to March 23, inclusive. Station discontinued April 30, 1914.

Daily discharge, in second-feet, of Genesee River near Jones' Bridge, Mt. Morris, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Mar.	April	DAY	Oct.	Nov.	Dec.	Mar.	April
1	98	572	572	....	9,840	16	213	1,230	687	....	8,040
2	106	572	572	....	9,570	17	134	1,120	572	....	7,270
3	102	484	528	....	9,060	18	148	1,120	528	....	4,800
4	136	442	484	....	5,720	19	143	1,060	484	....	3,610
5	138	422	434	....	4,100	20	198	1,010	484	....	3,260
6	148	402	484	....	3,190	21	346	1,010	484	....	2,920
7	198	422	484	....	2,790	22	383	1,060	484	....	2,530
8	198	506	484	....	9,310	23	422	810	422	....	2,150
9	260	910	528	....	10,900	24	422	810	422	1,500	1,790
10	148	4,870	484	....	6,760	25	364	810	664	2,660	1,500
11	124	2,400	528	....	7,270	26	484	687	618	8,720	1,790
12	124	1,910	550	....	7,100	27	710	687	....	15,500	2,030
13	277	1,670	572	....	5,170	28	860	664	....	18,000	1,790
14	260	1,450	550	....	3,680	39	810	618	....	17,900	1,560
15	228	1,620	641	....	3,050	30	664	595	....	16,000	1,450
						21	572	....	....	14,300	....

NOTE.— Discharge determined from fairly well-defined rating curve.

Monthly discharge of Genesee River at Jones' Bridge, near Mt. Morris, N. Y., for the year ending September 30, 1914

[Drainage area, 1,410 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	860	98	304	0.216	0.25	A
November	4,870	402	1,060	.752	.84	A
December	687	422	529	.375	.43	A
March	18,000	....	4,280	3.04	3.50	C
April	10,900	1,450	4,800	3.41	3.80	A

NOTE.— Mean discharge March 1 to 22, estimated 1,660 second-feet from records of the Genesee at St. Helena and Rochester.

GENESEE RIVER AT ROCHESTER, N. Y.

Location.— At the highway bridge known locally as Elmwood Avenue bridge, at the north end of South Park, 3½ miles above the center of the city of Rochester, 3¼ miles below the mouth of Black creek, and 7½ miles above the mouth of the river.

Records available.— February 9, 1904, to September 30, 1914. Fragmentary records before this period published in water supply papers 24, 65 and 97.

Drainage area.—2,360 square miles.

Gage.— Prior to 1910, a staff gage bolted to the downstream end of the first pier from the right-hand abutment was read once daily. From December, 1910, to September, 1914, gage heights recorded by a Gurley automatic water stage register in the pump house immediately below the bridge on the right-hand bank. Elevation of zero of gage, 506.80 Barge canal datum and 245.591 Rochester city datum. Gage datum unchanged since installation of the station.

Control.— Gravel, smooth; considered permanent.

Discharge measurements.— Made from bridge at which the staff gage is located. Prior to 1904, measurements and elevations of water surface taken in conjunction with the water flowing over and around Johnson-Seymour dam in the city of Rochester.

Winter flow.— Affected by ice for short periods, although as a rule the channel is open.

Accuracy.— Discharge rating curve well developed for all stages; published data considered good for periods of open water.

Co-operation.— Gage inspected by an employee of the Rochester Light & Railway Co.

Discharge measurements of Genesee River at Rochester, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Nov. 1	R. S. Barnes	1.32	589
1914			
Jan. 9*a*	W. S. Easterly	1.30	622
27*b*	do	1.63	928
Feb. 16*a*	C. S. De Golyer	1.90	808

a Backwater from ice. Measurement made from bridge and through ice.
b Backwater from ice. Measurement made through ice 200 feet below gage.

Daily gage height, in feet, of Genesee River at Rochester, N. Y., for the year ending September 30, 1914

[G. A. Pailey, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	0.80	1.28	1.28	1.26	6.6	1.74	9.4	2.6	2.03	1.24	1.00	1.42
2	.81	1.25	1.25	1.20	6.6	2.23	8.3	2.47	1.93	1.23	.99	1.38
3	.82	1.18	1.29	1.19	5.1	2.06	8.0	2.3	1.79	1.25	.99	2.10
4	.80	1.20	1.27	1.20	4.5	1.82	7.1	2.18	1.76	1.25	.98	3.15
5	.79	1.19	1.24	1.26	5.2	1.77	5.5	2.27	1.84	1.21	.99	2.55
6	.79	1.15	1.23	1.23	5.2	1.74	4.6	5.8	2.07	1.17	1.00	2.15
7	.75	1.13	1.24	1.22	3.45	1.74	4.2	7.5	2.00	1.15	.98	1.79
8	.84	1.08	1.18	1.20	1.75	1.69	5.6	6.3	1.84	1.14	.96	1.58
9	.85	1.08	1.22	1.25	2.24	1.70	7.7	5.3	1.79	1.13	.96	1.45
10	.91	1.37	1.23	1.51	2.38	1.68	7.2	6.6	1.86	1.11	1.00	1.36
11	.92	3.4	1.22	1.59	2.35	1.67	6.4	5.8	1.78	1.10	.98	1.30
12	.90	2.71	1.21	1.73	2.39	1.66	6.2	4.7	1.70	1.08	.98	1.22
13	.86	2.09	1.25	2.12	2.13	1.61	5.8	6.9	1.59	......	.99	1.18
14	.82	1.83	1.26	2.20	2.05	1.60	4.8	8.2	1.54	......	1.02	1.13
15	.90	1.93	1.31	2.00	1.97	1.64	4.15	8.7	1.47	......	.98	1.13
16	.90	2.12	1.38	1.34	1.85	2.28	4.7	8.0	1.46	1.09	.94	1.12
17	.90	1.95	1.34	1.36	1.86	4.8	6.3	5.6	1.41	1.10	.97	1.10
18	.91	1.81	1.27	1.66	1.86	6.6	5.6	4.05	1.39	1.09	1.00	1.10
19	.89	1.76	1.22	1.64	1.78	7.1	4.6	3.3	1.37	1.08	1.02	1.08
20	.87	1.70	1.19	1.53	1.85	5.9	4.05	3.05	1.36	1.02	1.15	1.05
21	.84	1.81	1.13	1.50	1.98	4.5	3.8	2.8	1.36	.99	1.48	.99
22	.94	1.90	1.17	1.58	1.91	3.6	3.55	2.55	1.37	1.03	2.35	1.00
23	.96	1.79	1.19	1.49	1.90	3.2	3.3	2.41	1.38	1.03	2.06	1.02
24	1.10	1.64	1.22	1.46	1.91	3.1	3.05	......	1.39	1.01	1.80	1.01
25	1.12	1.59	1.42	1.60	1.80	3.4	2.8	......	1.37	1.04	2.20	.98
26	1.12	1.52	1.59	1.69	1.76	5.6	2.85	2.12	1.32	1.07	2.12	1.03
27	1.21	1.48	1.30	1.63	1.64	8.3	3.05	2.06	1.28	1.04	1.71	1.09
28	1.61	1.39	1.24	1.78	1.60	9.5	3.1	2.29	1.26	1.04	1.47	1.07
29	1.67	1.41	1.25	2.5	......	10.2	2.9	2.5	1.25	1.04	1.40	1.07
30	1.44	1.34	1.27	4.8	......	10.8	2.7	2.26	1.26	1.03	1.38	1.09
31	1.30	......	1.29	6.3	......	10.4	......	2.12	......	1.01	1.40	......

NOTE.— Discharge relation affected by ice January 12 to 28, and February 9 to March 16 inclusive. Gage height is mean of 24 hourly gage heights for each day.

Daily discharge, in second-feet, of Genesee River at Rochester, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	190	587	587	564	12,800	......	21,900	2,640	1,650	542	320	755
2.....	196	554	554	500	12,800	......	18,200	2,410	1,490	532	313	705
3.....	202	480	598	490	8,400	......	17,200	2,100	1,270	554	313	1,760
4.....	190	500	576	500	6,800	......	14,300	1,900	1,230	554	306	3,670
5.....	186	490	542	564	8,680	......	9,530	2,050	1,350	510	313	2,550
6.....	186	451	532	532	8,680	......	7,060	10,400	1,710	470	320	1,840
7.....	170	432	542	521	4,280	......	6,040	15,600	1,600	451	306	1,270
8.....	214	387	480	500	1,210	......	9,820	11,900	1,350	442	292	970
9.....	220	387	521	554	1,840	......	16,200	8,960	1,270	432	292	794
10.....	257	692	532	874	1,930	......	14,600	12,800	1,380	414	320	680
11.....	264	4,180	521	984	1,760	......	12,200	10,400	1,260	405	306	610
12.....	250	2,840	510	970	1,520	......	11,600	7,320	1,140	387	306	521
13.....	226	1,740	554	874	1,130	......	10,400	13,700	984	370	313	480
14.....	202	1,340	564	742	1,010	......	7,590	17,800	914	362	336	432
15.....	250	1,490	622	633	900	......	5,920	19,500	820	370	306	432
16.....	250	1,790	705	564	742	......	7,320	17,200	806	396	278	423
17.....	250	1,520	656	587	755	7,590	11,900	9,820	742	405	299	405
18.....	257	1,300	576	970	755	12,800	9,820	5,670	718	396	320	405
19.....	244	1,230	521	942	656	14,300	7,060	3,970	692	387	336	387
20.....	232	1,140	490	794	742	10,700	5,670	3,480	680	330	451	362
21.....	214	1,300	432	755	914	6,800	5,070	3,000	680	313	833	313
22.....	278	1,440	470	860	820	4,610	4,500	2,550	692	344	2,190	320
23.....	292	1,270	490	742	806	3,770	3,970	2,300	705	344	1,700	336
24.....	405	1,060	521	705	820	3,570	3,480	2,100	718	328	1,290	328
25.....	423	984	755	887	680	4,180	3,000	1,900	692	353	1,930	306
26.....	423	887	984	1,010	633	9,820	3,100	1,790	633	378	1,730	344
27.....	510	833	610	928	500	18,200	3,480	1,700	587	353	1,150	396
28.....	1,010	718	542	1,140	460	22,200	3,570	2,080	564	353	820	378
29.....	1,100	742	554	2,460	......	24,600	3,190	2,460	554	353	730	378
30.....	780	656	576	7,590	......	26,800	2,820	2,030	564	344	705	396
31.....	610	....	598	11,900	......	25,300	......	1,790	......	328	730	......

NOTE.— Daily discharge May 24, 25, and July 13 to 15, estimated by hydrograph. Daily discharge values given during the frozen periods January 12 to 28, and February 9 to 28, are only approximate. Daily discharge determined from well-defined rating curve.

Monthly discharge of Genesee River at Rochester, N. Y., for the year ending September 30, 1914
[Drainage area, 2,360 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	1,100	170	338	0.143	0.16	A
November..................	4,180	387	1,110	.470	.52	A
December..................	984	432	571	.242	.28	A
January....................	11,900	490	1,380	.585	.67	B
February...................	12,800	460	2,970	1.26	1.31	B
March......................	26,800	....	6,660	2.82	3.25	B
April......................	21,900	2,820	8,680	3.68	4.11	A
May........................	19,500	1,700	6,560	2.78	3.20	A
June.......................	1,710	554	982	.416	.46	A
July.......................	554	313	403	.171	.20	B
August.....................	2,190	278	652	.276	.32	B
September..................	3,670	306	765	.324	.36	B
The year..............	26,800	278	2,580	1.09	14.84	.....

NOTE.— Mean discharge, March 1 to 16, estimated 706 second-feet.

OWASCO OUTLET NEAR AUBURN, N. Y.

Location.— On the farm of George Ridley, 3¾ miles below the State dam at the outlet of Owasco lake, 2 miles below the center of the city of Auburn.

Records available.— November 17, 1912, to September 30, 1914.

Drainage area.— 206 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Gurley automatic recording gage installed over a concrete well 3½ feet square and 6 feet deep (inside dimensions). Gage well connected with the river by a 4-inch cast iron pipe.

Control.— Gage heights registered by this gage controlled by a low concrete weir situated a short distance below the gage. The crest of this weir is 1 foot wide and the slopes of both upstream and downstream faces are ½ x 1. A small horizontal apron, built on a level with bed of stream, extends downstream 2½ feet from toe of dam. The mean elevation of the left-hand end of the dam for a distance of 50 feet is gage height 1.28 feet; the remaining 50 feet of the crest of the dam is at gage height 2.12 feet.

Discharge measurements.— Made by wading directly opposite the gage in low water and from a cable and car at the same section in high water.

Winter flow.— Ice does not form to a sufficient extent to obstruct the control, except during extreme cold.

Diversions.— An average flow of about 10 second-feet is pumped from Owasco lake for the municipal water supply of the city of Auburn. Proportion returning to stream above the gaging station not known.

Accuracy.— Discharge measurements are consistent and estimates are excellent. The discharge corresponding to the mean daily gage height does not represent the mean daily discharge. The mean gage height is therefore not published and the daily discharge in the following table is the mean of 24 hourly discharges for each day.

Discharge measurements of Owasco Outlet near Auburn, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Aug. 4*a*.......	C. H. Pierce..	2.17	156

a Measurement made by wading 95 feet below gage.

Daily discharge, in second-feet, of Owasco Outlet near Auburn, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	......	52.9	106	......	*a*	1.960	600	177	118	155	286
2	......	*a*56.2	83.4	......	......	2,120	530	159	121	*a*155	372
3	78.6	......	95.2	......	......	2,180	*a*510	159	120	161	361
4	56.6	63.8	83.9	*a*	......	2,090	476	153	91.5	155	347
5	*a*56.0	76.7	90.8	129	211	*a*1,960	463	148	*a*91.1	149	404
6	90.1	66.8	78.2	134	211	1,790	372	150	154	158	*a*373
7	79.6	70.2	*a*83.3	136	237	1,680	366	*a*148	138	168	385
8	71.6	46.8	84.6	132	*a*247	1,820	372	174	136	156	296
9	73.3	*a*99.9	......	139	234	1,970	......	176	148	*a*149	346
10	67.7	89.5	......	140	264	1,880	*a*	169	137	170	375

Daily discharge in second-feet, of Owasco Outlet near Auburn, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
11	64.7	67.1	......	a143	233	1,820	......	163	144	153	373
12	a47.3	66.3	......	151	220	a1,710	......	176	a128	151	357
13	99.1	77.3	......	154	263	1,610	......	152	149	147	a312
14	74.4	76.0	a	201	232	1,510	......	a134	136	142	326
15	74.4	56.0	......	247	a235	1,450	584	168	147	146	302
16	70.6	a70.0	115	254	272	1,430	569	161	148	a143	267
17	67.3	122	117	220	281	1,390	a533	183	327	149	315
18	56.7	80.9	109	a255	287	1,330	500	172	372	120	309
19	a53.3	94.9	90.2	273	307	a1,260	486	181	a397	134	262
20	113	93.4	74.8	316	305	1,210	483	140	317	130	a116
21	83.5	90.7	a117	342	300	1,170	418	a148	245	125	212
22	70.0	71.2	144	397	a301	1,120	370	158	246	133	102
23	70.0	a76.2	112	394	299	1,080	351	163	241	a127	227
24	69.4	103	110	442	289	1,030	a317	159	227	169	220
25	60.2	83.8	......	a272	315	1,020	302	149	225	153	223
26	a90.2	89.8	......	220	409	a978	301	151	a212	141	248
27	99.5	67.4	......	218	595	900	302	155	216	150	a179
28	77.3	105	a	220	1,080	788	292	a142	185	143	211
29	72.6	78.5	......	207	a1,390	714	287	140	149	202	203
30	74.2	a78.0	......	......	1,690	667	226	130	161	a194	192
31	70.9	......	......	......	1,870	......	a156	......	156	228	......

a Sunday.
NOTE.— Daily discharge determined from a very well-defined rating curve.

Monthly discharge of Owasco Outlet near Auburn, N. Y., for the year ending September 30, 1914
[Drainage area, 206 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	113	53.3	73.9	0.36	0.42	A
November	122	46.8	78.3	.38	.42	A
December	144	74.8	106	.51	.59	A
January	442	129	216	1.05	1.21	B
February	....	....	290	1.41	1.47	D
March	1,870	210	434	2.11	2.43	A
April	2,180	667	1,450	7.04	7.86	A
May	600	156	412	2.00	2.31	A
June	183	130	158	.767	.86	A
July	397	91.1	187	.908	1.05	A
August	228	125	154	.748	.86	A
September	404	102	285	1.38	.154	A
	2,180	46.8	319	1.55	21.02	.....

NOTE.— To make these data cover complete months, the mean discharge has been estimated for periods as follows: January 1 to 4, inclusive, 132 second-feet; January 30 and 31, 210 second-feet; March 1 to 4, inclusive, 217 second-feet; May 9 to 14, inclusive, 435 second-feet. The mean discharge in February was estimated from three gage heights observed during the month and the elevations of Owasco Lake.

SALMON RIVER AT STILLWATER BRIDGE NEAR REDFIELD, N. Y.

Location.— On Stillwater highway bridge 6¼ miles by road east of Altmar, ¼ mile above the dam being constructed by the Ontario Power Co., ⅞ mile below Pennock brook, and 7 miles below the mouth of North branch.

Records available.— June 24, 1911, to December 16, 1913, when the station was submerged by closing the above mentioned dam.

Drainage area.— 191 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Chain, attached to upstream side of bridge; datum unchanged.

Channel.— Small stone and gravel.

Discharge measurements.— Made from the bridge or by wading.

Accuracy.— Conditions for making measurements are favorable and open-water records are considered very good.

Co-operation.— Gage-height records obtained through co-operation of the Salmon River Power Co., of Niagara Falls, N. Y.

Discharge measurements of Salmon River at Stillwater, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Nov. 4........	G. H. Canfield....................................	2.57	326
4........	do	2.70	400

Daily gage height, in feet, and discharge in second-feet, of Salmon River at Stillwater Bridge near Redfield, N. Y., for 1913

[Salmon River Power Co., observer]

DAY	OCTOBER		NOVEMBER		DECEMBER	
	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
1	1.58	74	2.8	414	2.95	478
2	1.69	93	2.6	336	2.85	435
3	2.3	235	2.5	300	3.0	500
4	2.2	206	2.7	374	3.15	570
5	1.92	138	2.95	478	3.6	806
6	1.82	118	2.75	394	3.35	670
7	1.74	103	2.55	318	3.45	723
8	1.70	95	2.4	266	5.4	1,400
9	1.68	91	2.95	478	4.2	1,000
10	1.66	88	4.7	1,200	3.9	900
11	1.64	84	3.7	862	3.35	670
12	1.84	122	3.3	644	3.2	594
13	2.05	168	3.0	500	3.2	594
14	2.0	156	3.7	862	3.2	594
15	1.91	136	3.6	806	3.05	523
16	1.91	136	3.15	570	3.1	546
17	1.87	128	3.0	500	3.5	....
18	1.85	124	2.8	414	....	....
19	2.2	206	2.85	435	....	....
20	3.9	980	6.3	2,000	....	....

Daily gage height, in feet, and discharge in second-feet, of Salmon River at Stillwater Bridge near Redfield, N. Y., for 1913 — Continued

DAY	OCTOBER		NOVEMBER		DECEMBER	
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
21	5.5	1,750	5.4	1,750	....	....
22	4.5	1,385	4.2	1,170	....	....
23	3.7	862	3.8	920	....	....
24	3.4	696	3.8	920	....	....
25	5.3	1,600	3.5	750	....	....
26	4.8	1,400	3.35	670	....	....
27	3.9	980	3.25	619	....	....
28	3.35	670	3.1	546	....	....
29	3.2	594	3.05	523	....	....
30	3.25	619	3.05	523	....	....
31	3.05	523	....	....	....	....

NOTE.— Discharge relation probably affected by construction of dam below station on the following dates, when the discharge was estimated from flow at Fox Bridge: October 21, 25, 26; November 10, 20, 21; December 8, 9, 10. Station submerged by closing of dam December 17 Daily discharge determined from a well-defined rating curve.

Monthly discharge of Salmon River at Stillwater Bridge near Redfield, N. Y., for the year ending September 30, 1914
[Drainage area, 191 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,750	74	470	2.46	2.84	A
November	2,000	266	685	3.59	4.00	B
December	1,400	....	514	2.69	3.10	C

SALMON RIVER NEAR PULASKI, N. Y.

Location.— At a highway bridge known locally as Fox's bridge, about 2½ miles above the village of Pulaski, about 2½ miles above Trout brook (coming from the left), and 6½ miles above the mouth of the river.

Records available.— September 5, 1900, to June 30, 1907; August 16, 1908, to December 6, 1908; July 14, 1910, to April 30, 1914.

Drainage area.— 260 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— A vertical staff attached to the upstream end of the center pier of the bridge was read from September 5, 1900, to the winter of 1901–2, when it was destroyed by ice. On July 23, 1902, a chain gage was installed, the zero of which is 1.20 feet below the original staff gage zero. Datum of chain gage unchanged since established.

Control.— Gravel; fairly permanent.

Discharge measurements.— Made either by wading or from the bridge.

Winter flow.— Discharge relation affected by ice.

Accuracy.— Open-water curve well developed. Published data considered good. The following measurement was made by G. H. Canfield, November 3, 1913: Gage height, 3.10 feet; discharge, 392 second-feet.

Daily gage height, in feet, of Salmon River near Pulaski, N. Y., for the year ending September 30, 1914

[Seymour J. Fox, observer]

DAY	Oct.	Nov.	Dec.	Jan.	April	DAY	Oct.	Nov.	Dec.	Jan.	April
1.......	2.35	3.3	3.25	2.95	5.4	16.......	2.60	3.55	3.45	......	5.4
2.......	2.48	3.2	3.2	2.48	5.5	17.......	2.60	3.35	3.4	......	5.5
3.......	2.70	3.1	3.3	2.80	5.4	18.......	2.58	3.3	3.4	......	5.4
4.......	2.75	3.1	3.4	......	4.7	19.......	2.60	3.25	3.2	......	5.6
5.......	2.65	3.4	3.7	......	4.45	20.......	3.7	5.0	3.2	......	6.6
9.......	2.52	3.25	3.5	......	4.1	21.......	4.9	5.0	3.25	......	5.7
7.......	2.48	3.15	3.45	......	3.95	22.......	4.6	4.2	3.2	......	4.8
8.......	2.45	3.0	4.5	......	4.2	23.......	3.9	3.8	3.1	......	4.7
9.......	2.40	3.1	3.9	......	5.0	24.......	3.9	3.8	3.3	......	4.35
10.......	2.40	4.3	3.9	......	4.8	25.......	4.8	3.7	3.25	......	4.1
11.......	2.38	4.0	3.6	......	4.5	26.......	4.6	3.5	3.25	......	4.6
12.......	2.45	3.6	3.4	......	4.6	27.......	4.2	3.5	2.95	......	4.6
13.......	2.70	3.4	3.5	......	4.2	28.......	3.7	3.4	2.92	......	4.4
14.......	2.60	3.8	3.45	......	4.1	29.......	3.6	3.3	3.0	......	4.3
15.......	2.60	3.9	3.45	......	4.2	30.......	3.6	3.3	3.05	......	4.4
						31.......	3.45	......	3.0	......	......

NOTE.— Discharge relation affected by ice January 24 to March 31, inclusive. Station discontinued May 1, 1914.

Daily discharge in second-feet, of Salmon River near Pulaski, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	April	DAY	Oct.	Nov.	Dec.	Jan.	April
1.......	79	535	500	313	3,330	16.......	152	720	642	......	3,330
2.......	112	465	465	112	3,520	17.......	152	570	605	......	3,520
3.......	191	400	535	235	3,330	18.......	145	535	605	......	3,330
4.......	213	400	605	......	2,130	19.......	152	500	465	......	3,710
5.......	172	605	845	......	1,760	20.......	845	2,400	465	......	5,650
6.......	125	500	680	......	1,290	21.......	2,240	2,400	500	......	3,900
7.......	112	432	642	......	1,120	22.......	1,800	1,330	465	......	2,290
8.......	104	340	1,680	......	1,410	23.......	1,020	930	400	......	2,130
9.......	90	400	1,020	......	2,620	24.......	1,020	930	535	......	1,610
10.......	90	1,440	1,020	......	2,290	25.......	2,090	845	500	......	1,290
11.......	86	1,120	760	......	1,830	26.......	1,800	680	500	......	1,980
12.......	104	760	605	......	1,980	27.......	1,330	680	312	......	1,980
13.......	191	605	680	......	1,410	28.......	845	605	296	......	1,680
14.......	152	930	642	......	1,290	29.......	760	535	340	......	1,540
15.......	152	1,020	642	......	1,410	30.......	760	535	370	......	1,680
						31.......	642	......	340	......	......

NOTE.— Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of Salmon River near Pulaski, N. Y., for the year ending September 30, 1914

[Drainage area, 260 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	2,240	79	572	2.20	2.54	B
November....................	2,400	340	805	3.10	3.46	B
December....................	1,680	296	602	2.32	2.68	B
April....................	5,650	1,120	2,340	9.00	10.04	B

Orwell Brook near Altmar, N. Y.

Location.— At highway bridge 1½ miles by road northwest of Altmar and ⅛ mile above the confluence of Orwell brook with Salmon river.

Records available.— June 23, 1911, to September 30, 1914.

Drainage area.— 22.1 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Standard chain, attached to downstream side of bridge.

Control.— Composed of small stone and gravel.

Discharge measurements.— Made by wading at low stages, from bridge at high stages.

Winter flow.— No information. Discharge relation probably affected by ice.

Accuracy.— The discharge rating curve is well defined and estimates are good.

Co-operation.— Gage observer employed by the Niagara, Lockport & Ontario Power Co. of Niagara Falls, N. Y.

Daily gage height, in feet, of Orwell Brook near Altmar, N. Y., for the year ending September 30, 1914

[Mrs. A. G. White, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.80	2.35	2.25	2.35	3.6	......	3.7	2.42	2.00	2.25	1.80	2.02
2	1.82	2.25	2.28	2.35	3.5	......	3.8	2.30	1.95	2.20	1.75	2.00
3	1.85	2.20	2.30	2.35	3.4	......	3.35	2.30	1.95	2.12	1.75	2.00
4	1.79	2.25	2.35	2.32	2.62	......	3.1	2.25	2.05	2.00	1.75	2.08
5	1.78	2.25	2.35	2.30	2.55	......	2.45	2.68	2.02	2.00	1.75	1.95
6	1.75	2.20	2.30	2.35	2.65	......	2.65	2.68	2.00	1.95	1.75	1.98
7	1.75	2.15	2.40	2.45	2.60	......	2.60	2.58	2.05	1.90	1.72	2.08
8	1.75	2.10	2.82	2.45	2.55	......	2.90	2.38	4.2	1.90	1.72	1.98
9	1.75	2.38	2.72	2.40	2.65	......	3.2	2.35	3.0	1.90	1.70	1.95
10	1.75	2.58	2.48	2.22	2.65	......	2.98	2.30	2.45	1.85	1.75	1.95
11	1.75	2.42	2.42	2.58	2.65	......	2.90	2.30	2.35	1.80	1.80	1.95
12	1.95	2.35	2.58	2.78	2.55	......	2.88	2.30	2.30	1.80	1.70	1.90
13	1.95	2.32	2.38	2.80	......	......	2.58	2.60	2.20	1.80	1.70	1.85
14	1.90	2.45	2.35	2.74	......	......	2.78	2.60	2.08	1.80	1.70	1.81
15	1.85	2.35	2.35	2.70	......	3.15	2.70	2.38	2.00	1.80	1.70	1.80
16	1.85	2.34	2.35	2.65	......	3.5	3.4	2.30	2.00	1.78	1.70	1.80
17	1.85	2.25	2.44	2.60	......	3.7	3.05	2.25	2.00	1.85	1.74	1.80
18	1.90	2.22	2.42	2.55	......	2.75	2.85	2.20	1.98	1.80	1.88	1.80
19	2.00	2.30	2.41	2.40	......	2.55	2.80	2.20	2.00	1.80	1.90	1.80
20	3.0	2.95	2.35	2.45	......	2.52	2.82	2.15	2.00	1.80	1.90	1.80
21	3.1	2.68	2.35	2.50	......	2.45	2.68	2.15	2.00	1.80	2.00	1.75
22	2.75	2.55	2.32	2.50	......	2.35	2.52	2.15	2.00	1.80	1.90	1.75
23	2.55	2.50	2.40	2.45	......	2.30	2.48	2.22	2.00	1.90	1.85	1.75
24	2.95	2.45	2.40	2.40	......	2.30	2.40	2.15	1.95	1.82	1.98	1.75
25	2.90	2.40	2.40	2.45	......	2.88	2.45	2.15	1.95	1.80	1.88	1.90
26	2.92	2.35	2.35	2.55	......	3.5	2.65	2.10	1.90	1.80	1.80	1.88
27	2.64	2.30	2.70	2.62	......	4.7	2.62	2.10	1.85	1.80	1.75	1.90
28	2.55	2.25	2.52	2.80	......	4.8	2.52	2.10	1.98	1.75	1.75	2.00
29	2.40	2.25	2.45	3.2	......	4.4	2.48	2.05	2.08	1.80	2.28	1.95
30	2.40	2.25	2.45	3.6	......	4.0	2.55	2.05	2.40	1.80	2.45	1.90
31	2.40	......	2.40	3.5	......	3.6	......	1.95	......	1.80	2.22	......

Note.— Discharge relation affected by ice from about January 11 to February 3, and February 9 to March 17, inclusive.

Daily discharge, in second-feet, of Orwell Brook near Altmar, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	9	42	34	42	......	......	232	49	17	34	9	18
2.....	11	34	36	42	......	......	250	38	15	30	8	17
3.....	11	30	38	42	......	......	173	38	15	24	8	17
4.....	9	34	42	40	68	......	134	34	20	17	8	27
5.....	8	34	42	38	61	......	51	76	18	17	8	15
6.....	8	30	38	42	72	......	72	76	17	15	8	16
7.....	8	26	47	52	66	......	66	64	20	13	7	22
8.....	8	23	94	52	61	......	105	45	327	13	7	16
9.....	8	45	81	47	......	......	149	42	119	13	6	15
10.....	8	64	54	32	......	......	116	38	52	11	8	15
11.....	8	49	49	......	......	......	105	38	42	9	9	15
12.....	15	42	64	......	......	......	102	38	38	9	6	13
13.....	15	40	45	......	......	......	64	66	30	9	6	11
14.....	13	52	42	......	......	......	88	66	22	9	6	9
15.....	11	42	42	......	......	......	78	45	17	9	6	9
16.....	11	42	42	......	......	......	181	38	17	8	6	9
17.....	11	34	51	......	......	......	126	34	17	11	7	9
18.....	13	32	49	......	......	84	98	30	16	9	12	9
19.....	17	38	48	......	......	61	91	30	17	9	13	9
20.....	119	112	42	......	......	58	94	26	17	9	13	9
21.....	134	76	42	......	......	52	76	26	17	9	17	8
22.....	84	61	40	......	......	42	58	26	17	9	13	8
23.....	61	56	47	......	......	38	54	32	17	13	11	8
24.....	112	52	47	......	......	38	47	26	15	10	16	8
25.....	105	47	47	......	......	102	52	26	15	9	12	13
26.....	108	42	42	......	......	198	72	23	13	9	9	12
27.....	71	38	78	......	......	431	68	23	11	9	8	13
28.....	61	34	58	......	......	453	58	23	16	8	8	17
29.....	47	34	52	......	......	368	54	20	22	9	36	15
30.....	47	34	52	......	......	288	61	20	47	9	52	13
31.....	47	......	47	......	......	215	......	15	......	9	32	......

NOTE.— Daily discharge determined from a well-defined rating curve.

Monthly discharge of Orwell Brook near Altmar, N. Y., for the year ending September 30, 1914
[Drainage area, 22.1 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	134	8	38.6	1.75	2.02	B
November..................	112	23	44.0	1.99	2.22	A
December..................	94	34	49.4	2.24	2.58	A
January 1–10...............	....	....	42.9	1.94	.72	B
February....................	....	....	....	....	....	......
March.......................	453	....	85.6	3.87	4.46	C
April........................	250	47	99.1	4.48	5.00	A
May..........................	76	15	37.8	1.71	1.97	A
June.........................	327	11	34.8	1.57	1.75	B
July..........................	34	8	12.3	.556	.64	C
August......................	52	6	12.1	.547	.63	C
September..................	22	8	13.0	.588	.65	C

NOTE.— Mean discharge March 1 to 17, inclusive, estimated from comparison with nearby streams, 13 second-feet.

BLACK RIVER NEAR BOONVILLE, N. Y.

Location.— At highway bridge about 2 or 3 miles northeast of Boonville, equal distance by river downstream from Hawkinsville, and about 1 mile above the mouth of Sugar river, a small tributary from the left.

Records available.— February 16, 1911, to September 30, 1914.

Drainage area.— 303 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Standard chain, fastened to the downstream side of the bridge. A staff gage, graduated from 6 to 13 feet, is fastened to the downstream right-hand abutment and is used for high-water readings.

Control.— Rough and full of boulders; permanent.

Discharge measurements.— At high stages from a cable about one-half mile above the gage; at low stages, by wading at a section near the cable.

Winter flow.— Discharge relation affected by ice. Flow determined by frequent discharge measurements and climatologic records.

Regulation and diversion.— The State dam at Forestport, about 8 miles upstream, provides a storage reservoir with a capacity of about 2,000,000,000 cubic feet. Water is diverted from this reservoir during the navigation season through the Forestport feeder flowing west to a basin in Boonville, N. Y. The Black River canal flows north from this basin entering the Black river at the foot of Lyon Falls. A spillway from the basin overflows into Mill creek, a tributary of Black river. Water flowing through these two channels returns to the river below the gaging station, thus passing around it. The Black River canal also flows south from Boonville passing out of the Black river drainage and entering the summit level of the Erie canal at Rome. Occasional discharge measurements are made at three points to indicate the distribution of the diverted water. The water entering Boonville through the Forestport feeder is measured at the highway bridge near Spenyhill, about one mile northeast of Boonville. The water flowing north from the basin through the Black River canal is measured at the highway bridge just below the lock into this canal near the railroad stations. The water flowing south from the basin is measured at a private farm bridge about one mile southeast of Boonville. These measurements are published below.

Accuracy.— A well-defined discharge rating curve has been developed. The records do not give the total discharge of the drainage area.

Discharge measurements of Black River near Boonville, N.Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Jan. 12[a]	W. S. Easterly	5.00	235
21[b]	do	4.92	248
22[b]	do	4.97	240
Feb. 20[c]	C. S. De Golyer	4.92	212
Mar. 25[a]	do	4.55	213
June 20[d]	R. S. Barnes	3.55	77
Aug. 31	H. W. Fear	6.11	952

[a] Backwater from ice. Measurement made by wading 200 feet above gage.
[b] Backwater from ice. Measurement made through ice 200 feet below gage.
[c] Backwater from ice. Measurement made through ice 400 feet above gage.
[d] Measurement made by wading 200 feet above gage.

Discharge measurements of Forestport Feeder at Boonville, N. Y., during the year ending September 30, 1914

DATE		Made by	Gage height	Discharge
			Feet	*Sec.-ft.*
1913				
Oct.	2	W. S. Easterly	0.88	262
	28	G. H. Canfield	1.05	262
1914				
June	20	R. S. Barnes	1.25	296
July	11	C. S. De Golyer	1.28	240
	22	M. J. Maguire	1.00	240
	22	do	1.00	240
Aug.	5	do	.99	223
	5	do	1.00	219
	19	do	.99	228
	19	do	1.01	220
	31	Hartwell and Fear	1.19	207
Sept.	14	M. J. Maguire	.95	220
	14	do	.95	219

Discharge measurements of Black River Canal, flowing north, at Boonville, N. Y., during the year ending September 30, 1914

DATE		Made by	Gage height	Discharge
			Feet	*Sec.-ft.*
1913				
Oct.	2	W. S. Easterly	4.25	50.0
	28	G. H. Canfield	1.94	14.8
1914				
June	20	R. S. Barnes	4.05	43.6
July	11	C. S. De Golyer	3.72	67.0
	22	M. J. Maguire	1.22	57.0
	23	do	1.26	58.0
Aug.	5	do	.60	45.5
	5	do	.72	44.6
	19	do	3.74	65.0
	19	do	3.70	65.0
	31	O. W. Hartwell	4.26	47.4
Sept.	14	M. J. Maguire	4.28	46.0
	14	do	4.38	44.0

Discharge measurements of Black River Canal, flowing south, at Boonville, N. Y., during the year ending September 30, 1914

DATE		Made by	Gage height	Discharge
			Feet	*Sec.-ft.*
1913				
Oct.	2	W. S. Easterly	1.20	200
	28	G. H. Canfield	1.17	222
1914				
June	20	R. S. Barnes	1.15	208
July	11	C. S. De Golyer	1.44	158
	22	M. J. Maguire	1.35	165
	22	do	1.36	168
Aug.	5	do	1.53	156
	6	do	1.53	155
	19	do	1.19	85
	19	do	1.14	83
	31	H. W. Fear	1.79	142
Sept.	14	M. J. Maguire	1.39	155
	14	do	1.40	152

Daily gage height, in feet, of Black River near Boonville, N. Y., for the year ending September 30, 1914
[W. D. Charbonneau, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	3.18	3.95	4.9	4.55	5.6	4.75	7.6	7.2	3.6	3.38	3.22	5.8
2.....	3.34	3.8	5.15	4.7	5.8	4.8	7.8	6.4	3.49	3.4	3.18	5.2
3.....	3.45	4.3	5.3	4.9	5.6	4.85	7.6	6.3	3.49	3.6	3.13	4.7
4.....	4.05	3.38	5.5	4.8	5.8	4.8	7.4	6.3	3.45	3.48	3.18	4.6
5.....	4.2	3.5	5.6	4.65	5.7	4.85	7.2	6.6	3.6	3.6	3.08	4.25
6.....	3.95	3.32	5.3	4.6	4.75	4.8	6.6	6.8	3.6	3.6	3.14	3.9
7.....	3.38	3.10	5.3	4.7	4.8	4.8	6.5	6.6	3.8	3.75	3.09	4.1
8.....	3.26	3.5	5.4	4.8	4.6	4.85	6.8	6.7	4.1	3.9	3.12	4.1
9.....	3.08	5.2	5.15	4.7	4.8	4.7	7.5	6.6	4.1	3.65	3.15	3.9
10.....	3.12	8.2	5.1	4.8	5.35	4.8	7.2	6.5	4.0	3.42	3.18	3.95
11.....	3.23	8.0	5.25	4.8	5.25	4.65	6.8	6.6	4.1	3.36	3.41	3.65
12.....	3.38	7.6	5.4	4.9	5.15	4.5	6.8	6.5	4.1	3.55	4.1	3.42
13.....	3.24	7.3	5.3	4.95	5.1	4.65	6.8	6.7	4.0	3.95	3.65	3.32
14.....	3.28	5.9	5.1	4.9	5.2	4.75	6.7	6.9	4.0	4.0	3.22	3.42
15.....	3.22	5.4	5.05	5.5	5.25	4.8	6.8	6.1	3.9	3.8	3.21	3.46
16.....	3.22	5.4	4.85	4.5	5.4	4.65	6.9	6.2	3.8	3.75	3.28	3.34
17.....	3.20	5.05	5.0	4.5	5.2	4.5	7.4	6.3	3.6	3.6	3.21	3.30
18.....	3.13	4.95	5.0	4.6	5.05	4.55	7.6	6.3	3.34	3.6	3.22	3.19
19.....	3.12	4.9	4.6	4.5	5.0	4.65	8.1	5.8	3.28	3.45	3.36	3.28
20.....	4.15	5.8	4.75	4.6	4.8	4.65	9.8	5.5	3.36	3.32	3.55	3.32
21.....	5.6	6.4	4.6	4.8	4.75	4.85	9.2	5.2	3.28	3.35	3.9	3.34
22.....	6.3	6.0	4.65	4.95	4.75	4.95	8.1	4.9	3.32	3.21	4.2	3.22
23.....	5.4	5.8	4.4	4.9	4.7	4.95	7.9	4.9	3.35	3.32	4.4	3.25
24.....	5.35	5.8	4.6	4.85	4.75	5.15	7.7	5.0	3.22	3.35	4.7	3.26
25.....	5.25	5.7	4.7	4.8	4.8	4.6	7.7	4.95	3.28	3.42	4.6	3.32
26.....	5.1	5.3	4.8	4.85	4.6	5.4	7.6	4.95	3.18	3.32	4.5	3.43
27.....	4.85	5.05	4.55	4.95	4.65	7.2	7.7	4.9	3.22	3.28	4.4	3.35
28.....	4.8	4.8	4.7	4.85	4.8	8.9	7.6	4.8	3.30	3.22	4.4	3.22
29.....	4.75	5.0	4.7	5.05	......	9.3	7.4	4.6	3.8	3.25	5.0	3.32
30.....	4.9	4.8	4.6	5.4	......	8.4	7.4	3.85	3.6	3.28	6.3	3.30
31.....	4.7	......	4.8	5.7	......	7.4	......	3.7	......	3.20	6.1	......

Note.— Discharge relation affected by ice from December 27 to March 27, inclusive.

Daily discharge, in second-feet, of Black River at Boonville, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	40	136	370	194	630	194	2,380	1,940	84	59	44	795
2.....	55	111	470	227	630	205	2,620	1,210	71	61	40	490
3.....	66	205	535	275	558	216	2,380	1,140	71	84	36	305
4.....	154	59	630	250	605	216	2,160	1,140	66	70	40	275
5.....	184	72	680	216	580	227	1,940	1,370	84	84	33	194
6.....	136	53	535	205	238	216	1,370	1,540	84	84	37	127
7.....	59	34	535	227	250	227	1,290	1,370	111	104	33	164
8.....	47	72	580	250	194	238	1,540	1,460	164	127	36	164
9.....	33	490	470	227	238	205	2,270	1,370	164	90	38	127
10.....	36	3,110	450	250	390	227	1,940	1,290	145	63	40	136
11.....	45	2,860	512	......	335	194	1,540	1,370	164	57	62	90
12.....	59	2,380	580	......	290	164	1,540	1,290	164	78	164	63
13.....	46	2,050	535	......	275	194	1,540	1,460	145	136	90	53
14.....	49	855	450	......	290	216	1,460	1,640	145	145	44	63
15.....	44	580	430	......	290	238	1,540	990	127	111	43	68
16.....	44	580	352	......	335	205	1,640	1,060	111	104	49	55
17.....	42	430	410	......	275	174	2,160	1,140	84	84	43	51
18.....	36	390	410	......	238	194	2,380	1,140	55	84	44	41
19.....	36	370	275	......	227	216	2,980	795	49	66	57	49
20.....	174	795	320	......	194	216	5,240	630	57	53	78	53
21.....	680	1,210	275	216	174	275	4,410	490	49	56	127	55
22.....	1,140	920	290	238	174	305	2,980	370	53	43	184	44
23.....	580	795	227	238	164	305	2,740	370	56	53	227	46
24.....	558	795	275	238	174	390	2,500	410	44	56	305	47
25.....	512	735	305	216	184	227	2,500	390	49	63	275	53

Daily discharge, in second-feet, of Black River near Boonville, N. Y., for year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
26.....	450	535	335	227	154	490	2,380	390	40	53	250	64
27.....	352	430	250	262	164	1,140	2,500	370	44	49	227	56
28.....	335	335	250	238	194	4,010	2,380	335	51	44	227	44
29.....	320	410	250	305	......	4,540	2,160	275	111	46	410	53
30.....	370	335	250	430	......	3,360	2,160	119	84	49	1,140	51
31.....	305	......	250	580	......	2,160	......	97	......	42	990	......

NOTE.— Daily discharge determined from well-defined rating curve. Values given during the frozen period December 27 to March 27, inclusive, are approximate only.

Monthly discharge of Black River near Boonville, N. Y., for the year ending September 30, 1914
[Drainage area, 303 square miles]

MONTH	DISCHARGE IN SECOND-FEET			Accuracy
	Maximum	Minimum	Mean	
October	1,140	33	225.	B
November	3,110	34	738.	A
December	680	227	403.	A
January	580	....	227.	C
February	630	154	302.	B
March	4,540	164	690.	B
April	5,240	1,290	2,290.	A
May	1,940	97	934.	A
June	164	40	90.9	A
July	145	42	74.1	B
August	1,140	33	175.	A
September	795	41	129.	B
The year	5,240	33	523.	......

NOTE.— Mean discharge January 11 to 20, estimated 154 second-feet. See "Regulation and diversion" in station description.

MOOSE RIVER AT MOOSE RIVER, N. Y.

Location.— In the village of Moose River, about 3 miles downstream from McKeever station on the Adirondack division of the New York Central & Hudson River Railroad, 5 miles below the mouth of South Branch of Moose river, and nearly 20 miles above the junction of Black and Moose rivers at Lyons Falls.

Records available.— June 5, 1900, to September 30, 1914.

Drainage area.— 370 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Staff, in two sections, fastened to the left bank a short distance above cable; read twice daily. The gage datum was lowered 0.17 feet on February 28, 1903, and again 5.00 feet on January 1, 1913.

Control.— Composed of cobble and boulders; fairly permanent; current smooth; depth comparatively uniform. Just above the station is a small island on which ice and log jams occasionally form. Velocity from dam at McKeever to the station relatively slow; below the station velocity very high.

Discharge measurements.— Made from a cable a short distance below gage.

Artificial regulation.—A timber dam at McKeever is used for power and for the regulation of flow for log driving. During portions of the year, therefore, two gage readings a day may not give a representative mean. Seasonal distribution of flow affected by operation of State dam at Old Forge.

Winter flow.— Discharge relation affected by ice.

Accuracy.— Discharge rating curve for open channel fairly accurate. Published data for periods of open water considered good.

Discharge measurements of Moose River at Moose River, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 27	G. H. Canfield	8.37	1,380
27	do	8.34	1,360
1914			
June 19*a*	R. S. Barnes	5.48	150

a Measurement made by wading at regular section.

Daily gage height, in feet, of Moose River at Moose River, N. Y., for the year ending September 30, 1914

[Chris Hannan, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	5.8	6.8	7.2	6.6	6.5	6.7	9.5	10.1	6.1	6.8	5.4	7.2
2	5.95	6.0	7.0	6.45	7.1	6.8	9.5	9.6	6.1	6.4	5.5	6.25
3	6.5	6.7	6.8	6.4	7.1	6.8	9.4	9.6	6.1	7.5	5.55	5.38
4	6.8	6.7	6.4	6.15	6.9	6.7	9.2	9.4	6.15	7.0	5.55	7.6
5	6.3	7.1	6.5	6.1	6.8	6.8	9.0	9.2	6.9	5.75	5.7	7.2
6	6.1	7.0	6.4	5.8	7.0	7.0	8.8	9.3	7.0	5.8	5.85	6.7
7	6.1	6.8	5.9	5.85	6.8	7.1	8.5	9.4	6.8	6.2	5.95	6.6
8	6.0	6.7	6.8	5.85	6.8	7.0	8.4	9.1	7.0	6.35	6.1	6.6
9	5.85	7.2	7.8	5.95	6.7	7.3	9.2	9.0	7.2	6.6	5.75	6.45
10	5.6	11.2	7.2	6.1	6.6	7.8	9.3	8.9	7.0	7.3	5.9	6.4
11	5.5	9.4	6.8	5.8	6.6	8.0	9.2	8.8	6.3	7.0	5.8	6.2
12	5.18	8.4	6.8	6.2	6.6	7.8	9.0	8.4	6.6	7.4	6.0	5.55
13	5.44	8.4	7.0	6.35	6.6	7.4	8.7	8.2	6.6	7.1	5.75	5.6
14	5.8	8.1	6.8	6.5	6.6	7.2	8.4	8.2	5.75	6.35	5.6	6.1
15	6.0	8.2	6.8	6.7	6.6	7.0	8.4	8.1	5.8	6.8	5.7	6.1
16	6.2	8.1	6.5	6.8	6.5	6.8	9.2	7.9	5.7	6.35	5.55	6.1
17	6.1	7.7	6.6	6.3	6.6	6.6	8.8	7.8	5.65	5.8	5.7	6.05
18	6.3	7.5	6.8	5.32	6.6	6.6	9.7	7.5	5.6	5.7	5.55	5.95
19	5.8	7.6	6.6	5.5	6.7	6.7	11.2	7.0	5.45	5.3	6.2	6.0
20	6.6	8.2	6.6	5.95	6.6	6.6	14.4	6.9	6.0	5.6	6.1	5.6
21	8.8	9.2	5.7	6.15	6.45	6.5	13.1	6.8	5.7	5.5	5.95	6.1
22	8.8	8.6	6.1	6.45	6.5	6.7	11.8	6.45	5.75	5.4	6.8	6.1
23	8.1	8.9	5.85	6.45	6.4	7.0	10.6	6.6	5.55	5.7	6.35	5.9
24	7.8	8.3	5.25	6.4	6.45	7.4	10.1	5.65	5.48	6.0	6.7	5.85
25	7.4	8.0	5.29	5.7	6.5	7.6	9.8	6.25	5.6	6.35	7.0	6.0
26	7.7	7.8	5.6	6.2	6.6	7.8	9.8	6.6	5.5	5.95	6.6	6.35
27	8.4	7.8	6.25	6.5	6.7	8.4	9.8	6.6	5.4	5.29	6.15	6.25
28	8.1	8.0	6.05	6.45	6.7	9.0	10.3	6.5	5.28	5.41	6.1	6.35
29	7.8	7.7	6.3	6.5	......	10.2	10.9	6.6	7.0	5.3	6.5	6.4
30	7.5	7.6	6.6	6.4	......	10.1	10.8	6.35	7.2	5.3	8.2	6.2
31	7.0	......	6.35	6.5	......	9.7	......	5.5	......	5.4	8.0	......

NOTE.— Discharge relation affected by ice from about January 12 to March 16, inclusive.

Daily discharge, in second-feet, of Moose River at Moose River, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	229	545	710	476	......	2,390	2,960	316	545	126	710
2	272	286	625	426	......	2,390	2,480	316	409	151	362
3	442	510	545	409	......	2,300	2,480	316	855	164	121
4	545	510	409	331	......	2,120	2,300	331	625	164	910
5	377	665	442	316	......	1,940	2,120	585	216	202	710
6	316	625	409	229	......	1,760	2,210	625	229	243	510
7	316	545	257	243	......	1,510	2,300	545	346	272	476
8	286	510	545	243	......	1,430	2,030	625	393	316	476
9	243	710	1,020	271	......	2,120	1,940	710	476	216	426
10	176	4,230	710	316	......	2,210	1,850	625	755	257	409
11	151	2,300	545	229	......	2,120	1,760	377	625	229	346
12	79	1,430	545	......	......	1,940	1,430	476	805	286	164
13	136	1,430	625	......	......	1,670	1,290	476	665	216	176
14	229	1,220	545	......	......	1,430	1,290	216	393	176	316
15	286	1,290	545	......	......	1,430	1,220	229	545	202	316
16	346	1,220	442	......	......	2,120	1,080	202	393	164	316
17	316	965	476	......	476	1,760	1,020	189	229	202	301
18	377	855	545	......	476	2,570	855	176	202	164	272
19	229	910	476	......	510	4,230	625	138	103	346	286
20	476	1,290	476	......	476	10,000	585	286	176	316	176
21	1,760	2,120	202	......	442	7,260	545	202	151	272	316
22	1,760	1,590	316	......	510	5,030	426	216	126	545	316
23	1,220	1,850	243	......	625	3,500	476	164	202	393	257
24	1,020	1,360	93	......	805	2,960	189	146	286	510	243
25	805	1,150	101	......	910	2,660	362	176	393	625	286
26	965	1,020	176	......	1,020	2,660	476	151	272	476	393
27	1,430	1,020	362	......	1,430	2,660	476	126	101	331	362
28	1,220	1,150	301	......	1,940	3,170	442	99	128	316	393
29	1,020	965	377	......	3,060	3,860	476	625	103	442	409
30	855	910	476	......	2,960	3,740	393	710	103	1,290	346
31	625	......	393	......	2,570	......	151	......	126	1,150	......

NOTE.— Daily discharge determined from a fairly well-defined rating curve.

Monthly discharge of Moose River at Moose River, N. Y., for the year ending September 30, 1914
[Drainage area, 370 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,760	79	597	1.61	1.86	B
November	4,230	286	1,170	3.16	3.53	B
December	1,020	93	449	1.21	1.40	B
January 1-11 inclusive	476	229	317	.856	.35	B
March	3,060	....	763	2.06	2.38	C
April	10,000	1,430	2,900	7.84	8.75	B
May	2,960	202	1,230	3.34	3.73	B
June	710	99	346	.961	1.07	B
July	855	101	354	.957	1.10	B
August	1,290	126	347	.938	1.08	B
September	910	121	370	1.00	1.12	B

NOTE.— Mean discharge, March 1 to 16, estimated by comparison with nearby streams, 340 second-feet. Discharge estimates not corrected for storage at Old Forge dam and McKeever.

MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, N. Y.

Location.— About 300 feet below the highway bridge in Old Forge and about 400 feet below the dam.

Records available.— November 9, 1911, to September 30, 1913.

Drainage area.— 51.5 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Vertical staff on left bank of stream 300 feet below highway bridge.

Control.— Rock ledge about 200 feet below the gage. Channel fairly straight and uniform from dam to this point.

Discharge measurements.— Made by wading at low and medium stages and from the highway bridge at high stages.

Regulation.— Flow controlled at the dam.

Winter flow.— Ice does not form to an extent sufficient to affect gage heights at this station.

Accuracy.— Discharge rating curve well defined; estimates good.

Discharge measurements of Middle Branch of Moose River at Old Forge, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Mar. 24*a*	C. S. De Golyer	2.75	242
24*b*	do	2.75	238
June 18*c*	R. S. Barnes	.55	4.32
18*d*	do	2.50	192
18*d*	do	1.90	98.8

a Measurement made by wading 40 feet above gage.
b Measurement made by wading 200 feet above gage.
c Measurement made by wading 50 feet below gage.
d Measurement made by wading 30 feet above gage.

Daily gage height, in feet, of Middle Branch of Moose River at Old Forge, N. Y., for the year ending September 30, 1914

[Vernon S. Ervin, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.55	2.2	2.05	0.70	0.75	0.82	3.3	2.25	1.5	1.08	0.86	0.70
2	1.55	2.2	2.05	.72	.75	.85	3.4	2.3	1.5	1.55	1.35	.60
3	1.55	2.2	1.40	.72	.75	.85	3.4	2.2	.86	.99	1.65	.60
4	1.55	2.2	.75	.72	.75	1.28	3.4	2.15	1.9	.60	1.65	.60
5	1.55	2.2	.75	.72	.75	2.35	3.4	2.6	2.55	.60	1.65	.60
6	1.55	2.2	.75	.72	.75	2.3	3.3	2.75	2.35	.60	1.65	.60
7	1.55	2.3	.75	.72	.75	2.3	3.3	2.25	1.95	1.55	1.65	.60
8	1.55	2.45	.75	.72	.75	2.3	3.2	2.05	2.1	1.95	1.65	.60
9	1.55	2.45	.75	.72	.75	2.3	3.2	2.05	1.7	.99	1.65	.60
10	1.55	2.45	.75	.72	.75	2.25	3.2	2.05	1.5	.60	1.65	.70
11	1.9	2.45	.70	.72	.75	2.25	3.2	2.05	1.6	.60	1.65	1.0
12	2.25	2.45	.70	.72	.75	2.25	2.85	2.05	2.2	.60	1.85	1.8
13	2.25	2.45	.70	.72	.75	2.4	2.7	2.5	1.8	.60	1.95	1.85
14	2.25	2.65	.70	.72	.75	3.0	2.45	2.15	.86	1.24	1.95	1.85
15	2.25	2.85	.70	.72	.78	3.0	2.35	1.9	.60	1.5	1.75	1.85
16	2.25	2.8	.70	.72	.78	3.0	2.35	1.9	.60	.78	1.65	1.85
17	2.25	2.75	.70	.72	.78	3.0	2.35	1.6	.60	.60	1.65	2.0
18	2.25	2.7	.70	.72	.80	2.95	2.55	1.5	.60	.60	1.65	2.35
19	2.25	2.7	.70	.75	.80	2.9	2.85	1.5	.60	.60	1.65	2.35
20	2.25	2.65	.70	.75	.82	2.85	3.3	1.5	.60	.60	1.65	2.4
21	2.25	2.7	.70	.75	.82	2.85	4.3	1.5	.60	.60	1.65	2.4
22	2.25	2.7	.70	.75	.82	2.8	4.2	1.5	.60	1.24	1.65	2.4
23	2.25	2.65	.70	.75	.85	2.8	3.3	1.5	.60	1.9	1.65	2.4
24	2.25	2.65	.70	.75	.85	2.8	2.5	1.5	.60	2.1	1.65	2.4
25	2.25	2.6	.70	.75	.85	2.8	2.2	1.5	.60	1.03	1.65	2.4
26	2.2	2.6	.70	.75	.85	2.8	1.75	1.5	.60	.60	1.65	2.4
27	2.25	2.6	.70	.75	1.5	2.85	1.7	1.5	.60	.60	1.65	2.4
28	2.2	2.1	.70	.75	1.10	3.1	1.8	1.5	1.9	.60	1.65	2.4
29	2.2	2.9	.70	.75	......	3.3	1.8	1.5	2.7	1.24	1.65	2.35
30	2.2	2.1	.70	.75	......	3.3	2.25	1.5	2.25	1.5	1.65	2.35
31	2.2	......	.70	.75	......	3.3	......	1.5	......	1.5	1.12	......

NOTE.— Discharge relation affected by backwater from McKeever dam March 28 to May 5, inclusive.

Daily discharge, in second-feet, of Middle Branch of Moose River at Old Forge, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	60	142	120	9.0	11	14	262	76	56	26	15	9
2.....	60	142	120	9.8	11	15	262	87	56	60	44	5.8
3.....	60	142	48	9.8	11	15	262	100	15	22	70	5.8
4.....	60	142	11	9.8	11	39	258	100	99	5.8	70	5.8
5.....	60	142	11	9.8	11	166	256	202	201	5.8	70	5.8
6.....	60	142	11	9.8	11	158	253	240	166	5.8	70	5.8
7.....	60	158	11	9.8	11	158	252	150	106	60	70	5.8
8.....	60	184	11	9.8	11	158	249	120	127	106	70	5.8
9.....	60	184	11	9.8	11	158	246	120	75	22	70	5.8
10.....	60	184	11	9.8	11	150	246	120	56	5.8	70	9
11.....	99	184	9	9.8	11	150	246	120	65	5.8	70	22
12.....	150	184	9	9.8	11	150	225	120	142	5.8	92	86
13.....	150	184	9	9.8	11	175	220	192	86	5.8	106	92
14.....	150	220	9	9.8	11	298	175	134	15	36	106	92
15.....	150	262	9	9.8	12	298	155	99	5.8	56	80	92
16.....	150	251	9	9.8	12	298	155	99	5.8	12	70	92
17.....	150	240	9	9.8	12	298	160	65	5.8	5.8	70	113
18.....	150	230	9	9.8	13	286	160	56	5.8	5.8	70	166
19.....	150	230	9	11	13	274	170	56	5.8	5.8	70	166
20.....	150	220	9	11	14	262	......	56	5.8	5.8	70	175
21.....	150	230	9	11	14	262	......	56	5.8	5.8	70	175
22.....	150	230	9	11	14	251	......	56	5.8	36	70	175
23.....	150	220	9	11	15	251	......	56	5.8	99	70	175
24.....	150	220	9	11	15	251	......	56	5.8	127	70	175
25.....	150	210	9	11	15	251	......	56	5.8	24	70	175
26.....	142	210	9	11	15	251	......	56	5.8	5.8	70	175
27.....	150	210	9	11	56	262	......	56	5.8	5.8	70	175
28.....	142	127	9	11	27	262	......	56	99	5.8	70	175
29.....	142	274	9	11	......	262	......	56	230	36	70	166
30.....	142	127	9	11	......	262	......	56	150	56	70	166
31.....	142	......	9	11	......	262	......	56	......	56	28	......

NOTE.— Daily discharge determined from a well-defined rating curve. Daily discharge from March 28 to April 19, and May 1 to 5, computed from elevations of lake surface and gate openings at Old Forge dam.

Monthly discharge of Middle Branch of Moose River at Old Forge, N. Y., for the year ending September 30, 1914

[Drainage area, 51.5 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	150	60	118	2.29	2.64	A
November..................	262	127	194	3.77	4.21	A
December..................	120	9	17.9	.348	.40	B
January....................	11	9	10.3	.200	.23	B
February...................	56	11	14.3	.278	.29	B
March......................	298	14	205	3.98	4.59	A
April.......................	....	....	221	4.29	4.29	C
May........................	240	56	94.5	1.83	2.11	B
June.......................	230	5.8	60.6	1.18	1.32	B
July........................	127	5.8	29.7	.577	.67	B
August.....................	106	15	69.4	1.35	1.56	A
September..................	175	5.8	96.4	1.87	2.09	A
The year..............	298	5.8	94.4	1.83	24.90	.....

NOTE.— The above figures indicate the flow as regulated at the Old Forge dam. Mean discharge, April 20 to 30, inclusive, estimated 220 second-feet, from records of lake elevation and gate opening at the dam.

OSWEGATCHIE RIVER NEAR OGDENSBURG, N. Y.

Location.—At the steel highway bridge known locally as Eel Weir bridge, about 1 mile below the mouth of the outlet of Black lake and 5½ miles above the city of Ogdensburg and the mouth of the river.

Records available.— April 22, 1903, to September 30, 1914.

Drainage area.— 1,580 square miles. (From U. S. Geological Survey water supply papers.)

Gage.— Chain, fastened to the upstream side of the bridge; read once daily; datum unchanged.

Control.— Practically permanent. Channel rocky and partly artificial, the rock having been removed underneath the bridge by blasting to increase the bridge opening.

Discharge measurements.— Usually made from the bridge.

Regulation.— Two dams in the vicinity of the gage; one at Heuvelton, about 5 miles above, and one at Rensselaer Falls, 10 miles above.

Winter flow.— Discharge relation not affected by ice.

Accuracy.— Rating curve fairly well developed; open-water curve used throughout the year.

Discharge measurements of Oswegatchie River near Ogdensburg, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 29	G. H. Canfield	6.52	3,760
31*b*	do	6.46	3,530
Dec. 6*a*	C. S. De Golyer	5.89	2,380
6*b*	do	5.89	2,320
1914			
Feb. 21*a*	C. S. De Golyer	5.07	1,230
April 15*b*	do	7.18	6,230
15*b*	do	7.15	6,180
18*b*	do	7.37	6,700
Aug. 25*c*	H. W. Fear	4.70	584

a Measurement made from down stream side of bridge.
b Measurement made from up stream side of bridge.
c Measurement made by wading 10 feet above gage.

Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for the year ending September 30, 1914

[Joseph H. La Rue, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	4.6	6.6	6.1	5.4	6.6	4.8	8.4	7.1	4.95	4.8	4.7	4.75
2	4.75	6.1	6.0	5.35	6.4	4.8	8.6	7.1	4.9	4.8	4.75	4.75
3	4.8	6.1	6.0	5.3	6.4	4.85	8.8	7.1	4.95	4.85	4.7	4.92
4	4.8	6.1	6.1	5.2	6.4	4.9	8.9	7.0	4.85	4.9	4.7	4.9
5	4.8	6.1	6.0	5.1	6.6	4.9	8.9	6.8	4.9	4.9	4.7	4.9
6	4.8	6.0	5.9	5.1	6.6	4.8	8.6	6.7	4.9	5.0	4.7	5.05
7	4.8	5.9	5.95	5.1	6.4	4.8	8.4	6.6	4.9	5.0	4.7	4.92
8	4.8	5.9	6.0	5.1	6.5	4.85	8.0	6.4	4.95	5.0	4.6	4.9
9	4.9	5.6	5.9	5.1	6.4	4.9	8.0	6.4	4.9	5.0	4.6	4.9
10	4.9	6.0	5.9	5.1	6.2	4.85	7.8	6.3	5.0	5.0	4.55	4.9

Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for the year ending September 30, 1914 — Continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
11.....	4.9	6.2	5.9	5.1	6.0	4.8	7.6	6.2	5.0	5.0	4.5	4.9
12.....	4.9	6.2	5.9	5.1	6.0	4.8	7.6	6.0	5.0	5.0	4.5	4.9
13.....	4.8	6.4	5.8	5.1	6.0	4.8	7.6	6.1	5.0	4.95	4.5	4.9
14.....	4.8	6.5	5.9	5.1	5.9	4.8	7.5	6.0	5.0	5.0	4.5	4.9
15.....	4.8	6.5	5.9	5.1	5.85	4.8	7.5	5.7	5.0	5.0	4.5	4.9
16.....	4.8	6.5	5.9	5.1	5.7	5.15	7.4	5.7	5.0	5.0	4.5	4.82
17.....	4.8	6.5	6.0	5.0	5.65	5.35	7.3	5.75	4.95	4.95	4.5	4.8
18.....	4.8	6.2	5.95	5.0	5.45	5.6	7.3	5.65	4.9	5.0	4.5	4.8
19.....	4.8	6.1	5.8	5.0	5.35	5.85	7.5	5.5	4.9	5.0	4.5	4.78
20.....	5.0	6.2	5.9	5.0	5.3	6.0	7.5	5.5	4.9	4.9	4.6	4.7
21.....	5.3	6.2	6.0	5.0	5.15	6.2	7.6	5.4	4.9	4.8	4.6	4.7
22.....	5.4	6.5	5.95	5.0	5.0	6.2	7.5	5.4	4.8	4.8	4.6	4.7
23.....	5.9	6.6	5.85	5.0	5.0	6.1	7.4	5.25	4.85	4.8	4.6	4.72
24.....	6.0	6.6	5.8	5.0	5.0	5.9	7.4	5.2	4.85	4.8	4.6	4.7
25.....	6.1	6.4	5.8	4.95	4.95	5.8	7.4	5.2	4.8	4.8	4.6	4.7
26.....	6.1	6.4	5.6	4.9	4.9	5.9	7.3	5.4	4.7	4.8	4.65	4.7
27.....	6.4	6.4	5.75	4.9	4.9	6.8	7.2	5.25	4.65	4.8	4.65	4.65
28.....	6.6	6.4	5.65	4.9	4.85	7.2	7.1	5.1	4.7	4.8	4.6	4.65
29.....	6.6	6.4	5.6	4.95	......	7.8	7.0	5.2	4.9	4.7	4.6	4.62
30.....	6.6	6.2	5.55	5.4	......	8.2	7.1	5.2	4.8	4.75	4.7	4.6
31.....	6.5	......	5.5	6.4	......	8.2	......	5.2	......	4.7	4.75	......

NOTE.— Discharge relation probably not materially affected by ice.

Daily discharge, in second-feet, of Oswegatchie River near Ogdensburg, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	390	3,930	2,770	1,450	4,620	750	9,900	6,000	1,010	750	590	670
2.....	545	2,770	2,560	1,370	4,100	750	10,500	6,000	920	750	670	670
3.....	600	2,770	2,560	1,290	4,100	835	11,100	6,000	1,010	835	590	956
4.....	600	2,770	2,770	1,140	4,100	920	11,400	5,720	835	920	590	920
5.....	600	2,770	2,560	990	4,620	920	11,400	5,160	920	920	590	920
6.....	600	2,560	2,360	990	4,620	750	10,500	4,880	920	1,100	590	1,200
7.....	600	2,360	2,460	990	4,100	750	9,900	4,620	920	1,100	590	956
8.....	600	2,360	2,560	990	4,360	835	8,700	4,100	1,010	1,100	450	920
9.....	720	1,790	2,360	990	4,100	920	8,700	4,100	920	1,100	450	920
10.....	720	2,560	2,360	990	3,600	835	8,100	3,840	1,100	1,100	390	920
11.....	720	2,990	2,360	990	3,140	750	7,500	3,600	1,100	1,100	330	920
12.....	720	2,990	2,360	990	3,140	750	7,500	3,140	1,100	1,100	330	920
13.....	600	3,440	2,160	990	3,140	750	7,500	3,360	1,100	1,010	330	920
14.....	600	3,680	2,360	990	2,920	750	7,200	3,140	1,100	1,100	330	920
15.....	600	3,680	2,360	990	2,810	750	7,200	2,490	1,100	1,100	330	920
16.....	600	3,680	2,360	990	2,490	1,380	6,900	2,490	1,100	1,100	330	784
17.....	600	3,680	2,560	850	2,380	1,770	6,600	2,600	1,010	1,010	330	750
18.....	600	2,990	2,460	850	1,970	2,280	6,600	2,380	920	1,100	330	750
19.....	600	2,770	2,160	850	1,770	2,810	7,200	2,070	920	1,100	330	718
20.....	850	2,990	2,360	850	1,670	3,140	7,200	2,070	920	920	450	590
21.....	1,290	2,990	2,560	850	1,380	3,600	7,500	1,870	920	750	450	590
22.....	1,450	3,680	2,460	850	1,100	3,600	7,200	1,870	750	750	450	590
23.....	2,360	3,930	2,260	850	1,100	3,360	6,900	1,580	835	750	450	622
24.....	2,560	3,930	2,160	850	1,100	2,920	6,900	1,480	835	750	450	590
25.....	2,770	3,440	2,160	785	1,010	2,700	6,900	1,480	750	750	450	590
26.....	2,770	3,440	1,790	720	920	2,920	6,600	1,870	590	750	520	590
27.....	3,440	3,440	2,060	720	920	5,160	6,300	1,580	520	750	520	520
28.....	3,930	3,440	1,880	720	835	6,300	6,000	1,290	590	750	450	520
29.....	3,930	3,440	1,790	785	......	8,100	5,720	1,480	920	590	450	478
30.....	3,930	2,990	1,700	1,450	......	9,300	6,000	1,480	750	670	590	450
31.....	3,680	......	1,620	3,440	......	9,300	......	1,480	......	590	670	......

NOTE.— Daily discharge determined from rating curve which is somewhat uncertain. A new rating curve used, beginning February 1, 1914.

Monthly discharge of Oswegatchie River near Ogdensburg, N. Y., for the year ending September 30, 1914

[Drainage area, 1,580 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	3,930	390	1,440	0.911	1.05	B
November	3,930	1,790	3,140	1.99	2.22	B
December	2,770	1,620	2,300	1.46	1.68	B
January	3,440	720	1,050	.665	.77	B
February	4,620	835	2,720	1.72	1.79	C
March	9,300	750	2,600	1.65	1.90	B
April	11,400	5,720	7,920	5.01	5.59	B
May	6,000	1,290	3,070	1.94	2.24	B
June	1,100	520	913	.578	.64	C
July	1,100	590	909	.575	.66	C
August	670	330	464	.294	.34	C
September	1,200	450	759	.480	.54	C
The year	11,400	330	2,260	1.43	19.42	.....

NOTE.— Seasonable distribution of flow somewhat affected by the operation of the storage reservoir at Cranberry Lake.

EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS, N. Y.

Location.— 600 feet below the lower dam of the Newton Falls Paper Company in the village of Newton Falls; 4 miles above the mouth of the Little river and 10 miles below the outlet of Cranberry lake.

Records available.— October 6, 1912, to September 30, 1914.

Drainage area.— 166 square miles.

Gage.—Vertical staff gage read twice daily.

Control.— Bottom consists of small boulders and gravel, covered with waste from the pulp mill.

Discharge measurements.— Made by wading at low stages and from a cable 30 feet above the gage during high water.

Winter flow.— Ice effect is diminished by the disturbance of the water at the paper mill.

Regulation.— The dams of the paper mill cause some daily fluctuation, probably not enough to affect the accuracy of the records. Seasonal flow is largely controlled by dam at Cranberry lake. Range of gage heights probably not more than 5 feet.

Accuracy.— Discharge curve well defined for ordinary stages. No high-water measurements have yet been made. Estimates good.

Co-operation.— Gage heights obtained through the co-operation of the Newton Falls Paper Company.

Discharge measurements of East Branch of Oswegatchie River at Newton Falls, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Aug. 28	O. W. Hartwell	1.91	289
29[a]	H. W. Fear	.20	36.7

[a] Measurement made by wading at regular section.

Daily gage height, in feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for the year ending September 30, 1914

[Chas. H. Corp, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	1.9	2.3	2.3	2.0	0.8	2.4	3.8	1.8	1.8	1.8	2.2
2	1.9	1.15	2.25	2.0	2.2	2.4	4.0	1.8	1.8	0.6	2.4
3	1.9	2.2	2.15	2.0	2.1	2.4	3.5	1.8	1.5	0.1	2.3
4	1.9	2.2	1.9	0.1	2.0	2.4	3.4	1.8	0.8	1.35	2.3
5	0.45	2.15	2.05	2.0	2.0	1.5	3.4	1.8	1.3	1.8	2.3
6	2.0	2.0	2.25	2.0	2.0	2.6	3.4	1.8	2.3	1.8	0.75
7	1.9	1.9	0.95	1.8	2.0	2.6	3.3	0.1	2.0	1.8	1.7
8	1.95	1.9	2.3	1.7	0.1	2.6	3.2	1.8	2.0	1.8	2.3
9	1.9	0.7	2.3	1.9	2.2	2.6	3.2	1.9	2.0	0.6	2.0
10	1.9	2.5	2.05	2.0	2.2	2.4	2.8	2.0	2.0	1.25	2.0
11	1.85	2.3	2.05	0.1	2.2	2.4	3.2	1.8	2.0	1.9	2.0
12	0.42	2.3	2.3	1.9	2.2	0.1	2.8	1.8	1.3	2.0	2.0
13	1.6	2.3	2.3	1.8	2.2	2.5	2.7	1.8	2.0	2.0	0.65
14	2.1	2.35	0.8	......	2.2	2.3	2.6	0.1	2.0	2.0	1.5
15	1.95	2.35	2.3	......	0.8	2.1	2.5	1.8	2.0	2.0	2.0
16	1.9	1.1	2.3	......	2.2	2.0	2.5	1.8	2.0	1.15	2.0
17	1.85	2.25	2.3	......	2.2	2.2	1.4	1.8	2.0	1.9	2.0
18	1.85	2.2	2.3	......	2.1	2.6	2.3	1.8	2.0	2.4	2.0
19	0.3	2.3	2.3	......	2.0	3.3	2.2	1.1	1.15	2.3	2.0
20	1.9	2.6	2.05	......	2.0	4.2	2.2	0.85	1.5	2.1	0.65
21	2.05	2.7	0.10	......	2.0	3.8	2.3	0.1	1.8	2.1	1.4
22	2.25	2.3	1.8	......	0.1	3.8	2.3	0.1	1.8	2.1	2.0
23	2.4	2.1	2.05	......	2.1	4.0	2.3	0.1	1.8	1.2	2.0
24	2.6	2.3	1.9	......	2.0	4.0	0.1	1.35	2.0	1.9	2.0
25	2.8	2.2	0.8	......	2.0	3.9	2.0	1.8	2.0	2.1	2.0
26	2.8	2.2	1.45	......	2.2	4.0	2.0	1.8	0.65	2.0	2.0
27	3.0	2.1	1.7	......	2.2	4.3	1.8	1.8	1.35	2.0	0.65
28	2.9	2.0	1.7	......	2.3	4.2	1.8	0.1	1.8	1.5	1.5
29	2.8	2.0	1.7	......	1.8	4.0	1.8	1.8	1.8	0.45	2.0
30	2.8	2.0	1.7	......	2.7	3.7	1.8	1.8	1.8	0.1	2.0
31	2.3	......	1.85	......	2.7	......	0.1	......	1.8	1.45	......

NOTE.— Discharge relation affected by ice January 14 to February 28, inclusive. Gage height determined from two observations per day weighted in accordance with time of change of wheels and gates at the mill.

Daily discharge, in second-feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
1	266	366	366	304	99	402	860	262	262	262	350
2	266	127	353	304	350	402	940	262	262	75	402
3	266	340	327	304	326	402	750	262	205	28	376
4	266	340	266	28	304	402	715	262	99	50	376
5	53	327	302	304	304	205	715	262	171	262	376
6	290	290	353	304	304	460	715	262	376	262	93
7	266	266	101	262	304	460	680	28	304	262	242
8	278	266	366	242	28	460	645	262	304	262	376
9	266	74	366	282	350	460	645	282	304	75	304
10	266	422	302	304	350	402	520	304	304	163	304
11	255	366	302	28	350	402	645	262	304	282	304
12	51	366	366	282	350	28	520	262	171	304	304
13	202	366	366	262	350	430	490	262	304	304	81
14	314	380	84	......	350	376	460	28	304	304	205
15	278	380	366	......	99	326	430	262	304	304	304
16	266	120	366	......	350	304	430	262	304	148	304
17	255	353	366	......	350	350	188	262	304	282	304
18	255	340	366	......	326	460	376	262	304	402	301
19	42	366	366	......	304	680	350	140	148	376	304
20	266	452	302	......	304	1,020	350	106	205	326	84

Daily discharge, in second-feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for the year ending September 30, 1914 — continued

DAY	Oct.	Nov.	Dec.	Jan.	Mar.	April	May	June	July	Aug.	Sept.
21	302	482	30	......	304	860	376	28	262	326	188
22	353	366	244	......	28	860	376	28	262	326	304
23	394	314	302	......	326	940	376	28	262	155	304
24	452	366	266	......	304	940	28	50	304	282	304
25	512	340	84	......	304	900	304	262	304	326	304
26	512	340	174	......	350	940	304	262	81	304	304
27	576	314	222	......	350	1,060	262	262	50	304	81
28	544	290	222	......	376	1,020	262	28	262	205	205
29	512	290	222	......	262	940	262	262	262	59	304
30	512	290	222	......	490	820	262	262	262	28	304
31	366	......	255	......	490	......	28	......	262	59	......

NOTE.— Daily discharge determined from a rating curve that is well defined below 600 second-feet. New rating curve used, beginning January 1, 1914.

Monthly discharge of East Branch of Oswegatchie River at Newton Falls, N. Y., for the year ending September 30, 1914

[Drainage area, 166 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	576	42	313	1.89	2.18	A
November	482	74	323	1.95	2.18	A
December	366	30	277	1.67	1.92	A
January 1–13 inclusive	304	28	247	1.49	.72	A
March	490	28	304	1.83	2.11	A
April	1,060	28	590	3.55	3.96	B
May	940	28	460	2.77	3.19	B
June	304	28	201	1.21	1.35	A
July	376	50	252	1.52	1.75	A
August	402	28	229	1.38	1.59	A
September	402	81	277	1.67	1.86	A

NOTE.— Discharge figures indicate the flow as regulated by Cranberry Lake dam and paper mills above the station.

RAQUETTE RIVER AT PIERCEFIELD, N. Y.

Location.—About three-fourths mile above the head of Black rapids and one-half mile below the dam of the International Paper Company at Piercefield.

Records available.— August 20, 1908, to September 30, 1914.

Drainage area.— 723 square miles. (All but 16 square miles measured on U. S. Geological Survey topographic sheets.)

Gage.— August 20, 1908, to September 3, 1910, vertical staff fastened to a large pine stump. September 4 to December 31, 1910, chain gage fastened to same stump and having the same datum. January 1, 1911, to December 31, 1912, same chain gage with its datum 2 feet lower. During 1912 an automatic recording gage was installed in a galvanized sheet-iron house 4 feet by 6 feet inside dimensions, over a concrete well 3½ feet square inside dimensions and 15 feet deep. The well is connected with the river by a 4-inch cast-iron pipe 60 feet long. A shear gate valve is set at the inner end of the pipe for use in cleaning the well. The outer end of the pipe terminates in a concrete box 1 foot square, inside dimensions. This box is connected with the river by three small intake pipes 2 inches in diameter with a screen protection over their outer ends. This special construction was deemed necessary to keep wood pulp out of the intake pipe.

Control.— Head of Black rapids; the channel opposite the gage is a deep pond having no perceptible velocity.

Discharge measurements.— Made from a cable just above Black rapids at the section formerly used for boat measurements.

Winter flow.— Rapids, forming control, rarely freeze and measurements made with ice present indicate that the relation between discharge relation is little, if any, affected by ice. Open water discharge rating curve usually applicable throughout the year.

Regulation.— Low water flow controlled by dam of the International Paper Company. The numerous lakes in the upper part of the drainage basin afford considerable storage, most of which is controlled.

Accuracy.— Rating curve well defined. With fluctuations, due to regulation recorded by automatic gage, estimates are very good.

Discharge measurements of Raquette River at Piercefield, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Oct. 1	W. S. Easterly	3.34	252
Dec. 10	C. S. De Golyer	6.23	1,460
11	do	6.38	1,560
30	W. S. Easterly	5.36	989
1914			
Jan. 20	do	4.40	601
23	do	4.24	568
Feb. 24	C. S. De Golyer	4.08	482
April 20	do	8.87	3,890
20	do	8.57	3,590
June 17	R. S. Barnes	5.20	942
July 10	C. S. De Golyer	4.24	548
10	do	4.24	554

Daily gage height, in feet, of Raquette River at Piercefield, N. Y., for the year ending September 30, 1914

[F. Bedard, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	......	......	......	5.05	3.20	2.88	5.85	11.1	6.25	......	......	......
2	......	......	......	4.95	4.2	4.15	6.2	11.1	6.25	......	2.45	......
3	......	......	......	4.95	4.2	4.25	6.3	11.0	6.1	......	......	3.8
4	......	......	......	3.37	4.3	4.2	6.4	11.0	5.85	......	......	......
5	......	......	......	4.25	4.2	4.2	6.05	10.8	5.4	......	......	......
6	......	......	......	4.65	4.3	4.25	6.7	10.6	5.35	......	......	2.1
7	......	5.5	......	4.95	4.3	4.2	6.7	10.4	3.5	......	4.15	......
8	......	......	......	4.9	3.5	2.91	6.8	10.2	5.05	......	......	......
9	......	......	......	5.05	3.85	3.85	6.95	10.1	5.35	......	2.1	......
10	......	......	6.2	5.0	4.4	3.95	7.2	......	5.15	4.2	......	4.0
11	......	......	6.2	3.65	4.05	3.7	7.3	......	5.1	4.0	......	......
12	......	......	6.3	3.75	......	3.85	7.0	9.4	4.85	2.30	......	......
13	......	......	6.25	5.05	......	4.2	7.5	9.3	5.0	4.2	......	2.5
14	......	......	5.9	......	......	4.2	7.5	9.0	3.00	4.2	......	......
15	......	......	6.05	......	2.44	3.55	7.5	8.8	4.15	4.2	......	......

Daily gage height, in feet, of Raquette River at Piercefield, N. Y., for the year ending September 30, 1914 — continued

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
16	......	......	6.1	......	4.0	3.45	7.5	8.6	4.85	4.2	2.4	......
17	......	......	6.2	......	4.25	4.25	7.6	8.3	4.85	4.2	......	4.4
18	......	......	6.2	......	4.3	4.35	7.7	8.3	4.65	4.15	4.35	......
19	......	......	6.1	......	4.15	4.35	8.0	8.1	4.5	2.58	......	......
20	......	......	5.75	4.25	4.15	4.4	8.8	7.9	4.35	3.65	......	2.4
21	......	7.0	4.55	4.2	4.2	4.25	9.3	7.8	3.00	4.05	......	......
22	......	......	5.45	4.25	3.45	3.15	9.7	7.6	3.65	3.95	......	......
23	......	......	5.75	4.25	3.6	......	10.1	7.5	4.3	3.95	2.15	......
24	4.5	......	5.6	4.25	4.25	......	10.4	7.3	4.15	4.05	......	4.35
25	......	......	3.25	2.96	4.3	......	10.6	7.4	3.95	4.15	......	......
26	......	......	5.4	3.7	4.15	......	10.8	7.2	3.85	2.25	......	......
27	......	......	5.95	4.25	4.25	......	10.7	7.0	3.9	......	3.7	......
28	......	......	4.4	4.3	3.85	......	10.7	6.9	2.52	......	......	3.40
29	......	......	5.45	4.25	......	4.3	10.8	6.75	3.49	......	......	4.05
30	......	......	5.45	4.3	......	5.3	11.0	6.55	4.15	......	2.05	3.95
31	......	......	5.35	4.25	......	5.6	......	6.1	......	4.15	......	......

NOTE.— Discharge relation affected by ice. Automatic gage not in operation October 1 to December 9, and July 26 to September 27, inclusive. Gage heights computed from mean of 24 hourly gage heights for each day while the automatic gage was in operation. Gage height given etween July 26 and September 27 are single observations and not necessarily means for each day.

Daily discharge, in second-feet, of Raquette River at Piercefield, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	......	......	......	849	250	193	1,230	6,430	1,480	515	......	......
2	......	......	......	807	530	513	1,440	6,430	1,480	520	......	......
3	......	......	......	807	530	547	1,510	6,310	1,380	525	......	402
4	......	......	......	287	564	530	1,580	6,310	1,230	......	......	......
5	......	......	......	547	530	530	1,350	6,080	1,000	......	......	......
6	......	......	......	689	564	547	1,810	5,850	982	530	......	......
7	......	1,030	......	807	564	530	1,810	5,620	318	530	513	......
8	......	......	......	786	318	198	1,890	5,390	849	530	......	......
9	......	......	......	849	417	417	2,010	5,280	982	530	......	......
10	......	......	1,450	828	598	448	2,230	5,020	892	530	......	464
11	......	......	1,450	358	480	372	2,320	4,750	870	464	......	......
12	......	......	1,520	387	......	417	2,060	4,490	766	115	......	......
13	......	......	1,480	849	......	530	2,510	4,380	828	530	......	......
14	......	......	1,260	......	......	530	2,510	4,050	212	530	......	......
15	......	......	1,350	......	131	331	2,510	3,840	513	530	......	......
16	......	......	1,380	......	464	306	2,510	3,620	766	530	......	......
17	......	......	1,450	......	547	547	2,610	3,310	766	530	......	598
18	......	......	1,450	......	564	581	2,710	3,310	689	513	581	......
19	......	......	1,380	......	513	581	3,010	3,110	634	148	......	......
20	......	......	1,170	547	513	598	3,840	2,910	581	358	......	......
21	......	2,060	610	530	530	547	4,380	2,810	212	480	......	......
22	......	......	1,000	547	306	240	4,820	2,610	358	448	......	......
23	......	......	1,170	547	344	......	5,280	2,510	564	448	......	......
24	590	......	1,080	547	547	......	5,620	2,320	513	480	......	581
25	......	......	232	206	564	......	5,850	2,420	448	513	......	......
26	......	......	980	372	513	......	6,080	2,230	417	......	......	......
27	......	......	1,290	547	547	......	5,960	2,060	432	......	372	......
28	......	......	555	564	417	......	5,960	1,970	141	......	......	294
29	......	......	1,000	547	......	564	6,080	1,850	316	......	......	480
30	......	......	1,000	564	......	960	6,310	1,690	513	......	......	448
31	......	......	955	547	......	1,100	......	1,380	......	513	......	......

NOTE.— Daily discharge determined from a well defined rating curve. Daily discharge May 10, 11, and July 1 to 3, estimated by interpolation. New rating curve used beginning January 1, 1914.

Monthly discharge of Raquette River at Piercefield, N. Y., for the year ending September 30, 1914
[Drainage area, 723 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	....	....	411	0.569	0.66	D
November	....	....	1,260	1.74	1.94	D
December	....	....	1,220	1.69	1.95	B
January	849	206	599	.828	.95	B
February	598	131	474	.656	.68	B
March	1,100	193	520	.720	.83	B
April	6,310	1,230	3,330	4.61	5.14	A
May	6,430	1,380	3,880	5.37	6.19	A
June	1,480	141	704	.974	1.09	A
July	....	....	446	.617	.71	B
August	....	....	431	.596	.69	C
September	....	....	448	.620	.69	C
The year	6,430	....	1,150	1.59	21.52	.....

NOTE.— Mean discharge for period estimated as follows: December 1 to 9, 1,400 second-feet- January 14 to 19, 607 second-feet; February 20 and 14, 475 second-feet; March 23 to 28, 575 second-feet; July 4 and 5, 132 second feet; July 26 to 30, 442 second-feet; September 1 to 27, 452 second-feet. Estimates indicate the flow as regulated by the dam and numerous lakes immediately above the station.

RAQUETTE RIVER AT MASSENA SPRINGS, N. Y.

Location.— At concrete highway bridge at Massena Springs, 8 miles below Raymondville and 10 miles above the mouth of the stream.

Records available.— September 21 to October 17, 1903, and April 9, 1904, to September 30, 1914.

Drainage area.— 1,170 square miles.

Gage.— Original gage was a vertical staff fastened to a stone wall on the left bank about 50 feet upstream from the present bridge. This was replaced by a standard chain gage on August 16, 1906, fastened to and old highway bridge located just above the present bridge. The datum of the chain gage was set 1.00 lower than that of the staff gage to prevent negative gage heights. On February 2, 1912, the chain gage was reset on the present concrete bridge at such a datum that readings should be comparable with those at the former location.

Channel.— Fairly permanent; bed of river of coarse gravel and small boulders.

Discharge measurements.— Made from bridge.

Regulation.— The operation of a number of power plants above the station has marked effect on the low water discharge of the stream. These plants are usually run for 24-hour power, but are closed on Sundays. The effect of the Sunday closing is shown in the stream for several days.

Winter flow.— Discharge relation affected by ice. Gage observation suspended during frozen period.

Accuracy.— Determinations of discharge for low water periods may be considerably in error as a result of regulation of flow.

Discharge measurements of Raquette River at Massena Springs, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1913		*Feet*	*Sec.-ft.*
Dec. 8	C. S. De Golyer	3.85	1,910
9	do	4.39	2.270
1914			
April 16	C. S. De Golyer	5.96	3,930
Aug. 27[a]	H. W. Fear	1.37	280

[a] Left channel measured from down stream side of bridge, right channel measured by wading under center of bridge.

Daily gage height, in feet, of Raquette River at Massena Springs, N. Y., for the year ending September 30, 1914

[Vivian McDonald, observer]

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	1.65	3.9	4.8	9.1	9.5	5.2	2.25	2.35	3.2
2	1.65	3.2	4.8	9.0	9.1	5.9	2.3	2.0	2.6
3	1.7	3.5	4.9	7.8	9.0	4.7	2.35	2.6	2.8
4	1.65	3.7	4.2	9.1	8.8	4.2	1.8	2.1	1.95
5	1.45	3.6	4.4	8.2	9.6	3.9	1.4	1.8	2.45
6	1.5	3.4	4.4	......	8.4	4.4	1.95	1.4	3.3
7	1.6	3.6	4.6	......	8.0	3.7	2.5	1.85	2.7
8	1.35	3.6	4.0	......	7.9	3.5	2.3	1.75	2.4
9	1.35	3.2	3.6	......	8.6	3.2	2.7	2.0	3.1
10	1.1	3.6	4.4	......	8.1	3.4	2.0	2.3	3.6
11	1.1	4.0	4.5	......	7.8	3.3	2.4	2.6	1.65
12	1.1	3.8	4.4	......	9.0	3.1	2.15	1.65	2.9
13	.85	3.8	4.6	......	9.2	3.0	1.6	1.6	3.0
14	1.8	3.6	4.7	......	7.6	3.0	1.6	1.75	2.15
15	1.6	3.4	4.5	......	6.9	3.7	1.7	1.7	2.25
16	.85	4.2	4.5	6.2	6.5	2.8	2.5	1.95	2.15
17	1.05	4.3	5.5	7.4	6.3	3.3	1.9	1.9	2.4
18	1.0	4.3	4.6	6.4	6.4	3.0	1.9	1.8	1.45
19	2.0	4.2	6.0	7.5	7.6	2.4	1.75	1.6	2.1
20	.8	4.3	5.8	7.0	6.4	3.9	1.95	1.6	2.6
21	1.45	4.6	5.6	7.8	6.2	3.4	1.95	2.2	2.15
22	2.0	4.7	6.4	7.3	6.0	2.6	1.75	1.8	1.45
23	3.5	4.5	5.7	9.0	5.6	2.8	2.5	1.4	1.7
24	2.9	4.9	6.8	7.9	5.8	2.05	1.6	1.8	1.85
25	3.4	4.8	5.8	9.4	4.8	2.4	2.3	2.2	2.15
26	4.2	4.8	6.0	8.7	4.9	2.4	1.65	2.5	2.9
27	4.0	5.0	6.4	9.1	5.6	2.4	1.85	1.8	3.0
28	3.8	4.7	5.4	9.1	5.7	2.0	1.95	2.15	1.3
29	3.8	4.8	5.9	8.8	4.8	1.4	1.9	2.6	1.95
30	3.8	5.0	5.8	8.9	5.4	2.25	1.75	1.45	1.5
31	4.7	......	......	......	5.4	......	2.2	1.95	......

NOTE.— Discharge relation affected by ice December 17 to March 31, inclusive.

Daily discharge, in second-feet, of Raquette River at Massena Springs, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	April	May	June	July	Aug.	Sept.
1	300	1,840	2,690	8,200	8,800	3,100	662	712	1,280
2	300	1,260	2,690	8,050	8,200	3,870	690	535	865
3	320	1,500	2,790	6,315	8,050	2,590	712	865	1,000
4	300	1,660	2,110	8,200	7,750	2,110	445	585	512
5	220	1,580	2,290	6,870	8,960	1,840	290	445	775
6	240	1,420	2,290	......	7,160	2,290	512	290	1,350
7	280	1,580	2,490	......	6,590	1,660	805	468	930
8	185	1,580	1,930	......	6,450	1,580	690	425	745
9	185	1,260	1,580	......	7,450	1,280	930	535	1,210
10	110	1,580	2,290	......	6,730	1,420	535	690	1,580
11	110	1,930	2,390	......	6,320	1,350	745	865	385
12	110	1,750	2,290	......	8,050	1,210	610	385	1,070
13	52	1,750	2,490	......	8,350	1,140	365	365	1,140
14	370	1,580	2,590	......	6,040	1,140	365	425	610
15	280	1,420	2,390	......	5,110	1,660	405	405	662
16	52	2,110	2,390	4,230	4,590	1,000	805	512	610
17	98	2,200	......	5,780	4,350	1,350	490	490	745
18	85	2,200	......	4,470	4,470	1,140	490	445	307
19	470	2,110	......	5,910	6,040	745	425	365	585
20	45	2,200	......	5,240	4,470	1,840	512	365	865
21	220	2,490	......	6,320	4,230	1,420	512	635	610
22	470	2,590	......	5,640	3,990	865	425	445	307
23	1,500	2,390	......	8,050	3,540	1,000	805	290	405
24	1,040	2,790	......	6,450	3,760	560	365	445	468
25	1,420	2,690	......	8,650	2,690	745	690	635	610
26	2,110	2,690	......	7,600	2,790	745	385	805	1,070
27	1,930	2,890	......	8,200	3,540	745	468	445	1,140
28	1,750	2,590	......	8,200	3,650	535	512	610	260
29	1,750	2,690	......	7,750	2,690	290	490	865	512
30	1,750	2,890	......	7,900	3,320	662	425	307	325
31	2,590	......	......	......	3,320	......	635	512	......

NOTE.—Daily discharge determined from a rating curve that is fairly well defined. New rating curve used beginning April 1, 1914.

Monthly discharge of Racquette River at Massena Springs, N. Y., for the year ending September 30, 1914
[Drainage area, 1,170 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	2,590	52	666	0.569	0.66	B
November	2,890	1,260	2,040	1.74	1.94	B
December	....	....	2,020	1.73	1.99	C
April	8,650	4,230	6,440	5.50	6.14	B
May	8,960	2,690	5,530	4.73	5.45	B
June	3,870	290	1,400	1.20	1.34	B
July	930	365	555	.474	.54	C
August	865	290	521	.445	.51	C
September	1,580	260	764	.653	.73	C

NOTE.— Mean discharge estimated by comparison with records at Piercefield as follows: December 17 to 31, 1,660 second-feet; April 6 to 15, 5,510 second-feet.

ST. REGIS RIVER AT BRASHER CENTER, N. Y.

Location.— At the steel highway bridge in the village of Brasher Center, 5 miles downstream from Brasher Falls, 6¼ miles below the junction of east and west branches of St. Regis river and about 12 miles above the mouth.

Records available.— August 22, 1910, to September 30, 1914.

Drainage area.— 621 square miles. (Measured on Post Route map.)

Gage.— Chain, fastened to downstream side of bridge; read twice daily; datum unchanged.

Control.— Fairly permanent. Channel very rough; composed of gravel and large boulders.

Discharge measurements.— At low stages made by wading about 500 feet above the bridge; at high stages made from the bridge.

Winter flow.— Discharge relation affected by ice. Gage observations suspended during frozen period.

Accuracy.— Discharge rating curve well developed; estimate good.

Discharge measurements of St. Regis River at Brasher Center, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Feb. 23[a]......	C. S. De Golyer....................................	6.08	339
April 17.......	do	5.87	3,120
17.......	do	5.89	3,010
July 9[b]......	do	4.12	320

[a] Backwater from ice. Measurement made through ice 500 feet above gage.
[b] Measurement made by wading 500 feet above gage.

Daily gage height, in feet, of St. Regis River at Brasher Center, N. Y., for the year ending September 30, 1914
[Joseph Vanier, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	4.05	4.9	4.65	7.0	6.2	......	6.2	6.3	4.32	4.40	3.88	4.7
2.....	4.12	4.75	4.45	6.2	6.1	......	7.6	6.0	4.40	4.38	3.88	4.7
3.....	4.5	4.65	4.75	6.2	6.2	......	7.6	5.75	4.40	4.45	3.85	4.8
4.....	4.8	4.55	4.9	6.1	5.15	......	6.8	5.6	4.35	4.28	4.00	4.8
5.....	4.85	4.42	4.85	6.4	5.15	......	6.2	5.5	4.45	4.18	4.02	4.65
6.....	4.7	4.42	4.7	6.4	5.5	......	5.65	5.4	4.5	4.15	3.90	4.4
7.....	4.5	4.5	4.8	5.7	5.55	......	5.9	5.4	4.48	4.20	3.82	4.35
8.....	4.38	4.55	4.9	5.5	6.2	......	5.25	5.4	4.40	4.22	3.80	4.55
9.....	4.31	4.6	4.85	5.55	6.4	......	5.4	5.3	4.5	4.18	3.78	4.6
10.....	4.22	4.8	4.7	5.65	7.2	......	5.4	5.15	4.45	4.18	3.75	4.7
11.....	4.18	5.1	4.7	6.2	7.0	......	5.4	5.0	4.28	4.12	3.80	4.55
12.....	4.20	5.05	4.6	6.2	7.2	......	5.25	4.75	4.2	4.12	3.78	4.28
13.....	4.28	4.9	4.55	6.4	......	......	5.25	4.85	4.15	4.02	3.85	4.15
14.....	4.28	4.85	4.7	6.4	......	......	5.25	4.75	4.05	3.99	4.02	4.02
15.....	4.32	4.8	4.95	......	......	......	5.1	4.8	4.10	4.05	3.98	4.30
16.....	4.38	4.7	5.15	......	......	......	5.35	4.7	4.12	4.25	3.90	4.18
17.....	4.30	4.7	4.75	......	......	......	5.8	4.5	4.25	4.05	3.88	4.05
18.....	4.25	4.6	4.8	......	......	7.4	6.0	4.6	4.15	4.00	4.08	3.95
19.....	4.30	4.5	5.25	......	......	6.4	6.2	4.55	4.15	3.98	4.00	3.98
20.....	4.38	5.1	4.9	......	......	6.8	7.2	4.45	4.20	3.88	3.98	3.92
21.....	5.15	5.4	4.7	......	......	6.5	7.1	4.6	4.18	4.05	4.00	3.82
22.....	5.3	5.3	4.6	......	......	5.5	6.7	4.5	4.22	3.98	4.15	3.90
23.....	5.3	5.2	4.7	......	6.1	5.55	6.2	4.32	4.25	3.98	4.02	3.90
24.....	5.2	5.1	4.7	......	......	6.0	6.2	4.35	4.15	4.12	3.92	3.85
25.....	5.1	5.1	4.6	......	......	7.0	5.8	4.5	4.10	4.12	3.95	3.80
26.....	5.1	5.2	4.5	......	......	8.3	5.8	4.5	4.08	4.12	3.88	3.80
27.....	5.3	4.95	5.15	......	......	8.8	6.2	4.55	4.22	4.05	3.80	3.88
28.....	5.25	4.9	6.0	......	......	7.3	6.3	4.42	4.08	4.25	4.00	4.00
29.....	5.2	4.85	5.7	......	......	7.0	6.3	4.40	4.10	4.05	3.95	4.42
30.....	5.1	4.75	5.3	7.0	......	6.8	6.3	4.35	4.40	3.98	4.12	4.45
31.....	4.9	......	5.35	6.3	......	6.4	......	4.30	......	3.95	4.3	......

NOTE.— Discharge relation affected by ice from December 27 to March 27, inclusive, and by backwater from ice jam April 2 to 4.

Daily discharge, in second-feet, of St. Regis River at Brasher Center, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	277	1,130	801	......	......	......	3,950	4,270	428	500	152	820
2	322	925	590	......	......	......	6,850	3,360	500	482	152	820
3	638	801	925	......	......	......	5,650	2,710	500	550	140	940
4	990	690	1,130	......	......	......	4,600	2,360	455	395	210	940
5	1,060	561	1,060	......	......	......	3,950	2,150	550	322	222	765
6	860	561	860	......	......	......	2,480	1,940	600	302	160	500
7	638	638	990	......	......	......	3,090	1,940	580	335	128	455
8	524	690	1,130	......	......	......	1,640	1,940	500	350	120	655
9	463	742	1,060	......	......	......	1,940	1,740	600	322	114	710
10	392	990	860	......	......	......	1,940	1,460	550	322	105	820
11	362	1,430	860	......	......	......	1,940	1,220	395	283	120	655
12	376	1,350	742	......	......	......	1,640	880	335	283	114	395
13	438	1,130	690	......	......	......	1,640	1,000	302	222	140	302
14	438	1,060	860	......	......	......	1,640	880	240	205	222	222
15	472	990	1,200	......	......	......	1,380	940	270	240	200	410
16	524	860	1,510	......	......	......	1,840	820	283	372	160	322
17	454	860	925	......	......	......	2,830	600	372	240	152	240
18	415	742	990	......	......	......	3,360	710	302	210	258	185
19	454	638	1,680	......	......	......	3,950	655	302	200	210	200
20	524	1,430	1,130	......	......	......	7,700	550	335	152	200	170
21	1,510	1,940	860	......	......	......	7,250	710	322	240	210	128
22	1,760	1,760	742	......	......	......	5,650	600	350	200	302	160
23	1,760	1,590	860	......	339	......	3,950	428	372	200	222	160
24	1,590	1,430	860	......	......	......	3,950	455	302	283	170	140
25	1,430	1,430	742	......	......	......	2,830	600	270	283	185	120
26	1,430	1,590	638	......	......	......	2,830	600	258	283	152	120
27	1,760	1,200	......	......	......	......	3,950	655	350	240	120	152
28	1,680	1,130	......	......	......	8,150	4,270	520	258	372	210	210
29	1,590	1,060	......	......	......	6,850	4,270	500	270	240	185	520
30	1,430	925	......	......	......	6,050	4,270	455	500	200	283	550
31	1,130	......	......	......	......	4,600	.....	410	......	185	410	......

NOTE.— Daily discharge for periods of open water determined from well defined rating curves. New rating curve was used beginning March 28, 1914. Daily discharge April 2 to 4 estimated by hydrograph study of backwater conditions.

Monthly discharge of St. Regis River at Brasher Center, N.Y., for the year ending September 30, 1914
[Drainage area, 621 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	1,760	277	893	1.44	1.66	A
November	1,940	561	1,080	1.74	1.94	A
December	1,680	590	919	1.48	1.71	A
April	7,700	1,380	3,570	5.75	6.42	B
May	4,270	410	1,230	1.98	2.28	A
June	600	240	388	.625	.70	A
July	550	152	291	.469	.54	B
August	410	105	185	.298	.34	B
September	940	120	426	.686	.77	A

NOTE.— Mean discharge December 27 to 31 estimated 760 second-feet.

DEER RIVER AT BRASHER IRON WORKS, N. Y.

Location.— About 1,000 feet below steel highway bridge in the village of Brasher Iron Works (railroad station in Ironton, and 2 miles above the confluence of Deer river with St. Regis river in Helena, N. Y. No important tributaries enter between the gage and the mouth of the river. A small creek enters from the left about 1 mile above the station.

Records available.— July 25, 1912, to September 30, 1914.

Drainage area.— 206 square miles. (Measured on Post Route map.)

Gage.— Sloping staff gage, 32 feet long, graduated from 0.5 to 11.0 feet.

Control.— Gravel about 300 feet below the gage; probably permanent. The stream bed at the bridge is solid rock and smooth.

Discharge measurements.— During medium and high stages made from the bridge; at low stages made by wading a short distance above.

Winter flow.— Discharge relation seriously affected by ice during the winter months. Gage observations suspended during this period.

Accuracy.— Rating curve fairly well defined.

Discharge measurements of Deer River at Brasher Iron Works, N.Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
July 9[a].......	C. S. De Golyer....................................	1.36	75

[a] Measurement made by wading 300 feet above gage.

Daily gage height, in feet, of Deer River at Brasher Iron Works, N. Y., for the year ending Septembe 30, 1914

[Alex. Barlow, observer]

DAY	Oct.	Nov.	Dec.	Mar.	April	May	June	July	Aug.	Sept.
1	0.95	1.75	1.88	......	3.7	3.3	1.22	1.48	1.08	1.65
2	1.14	1.65	1.92	......	4.2	3.0	1.32	1.45	1.05	1.82
3	1.86	1.64	2.0	......	3.3	2.6	1.35	1.40	1.08	1.78
4	2.0	1.61	2.3	......	2.8	2.4	1.38	1.40	.95	1.65
5	1.75	1.64	2.3	......	2.75	2.45	1.40	1.35	1.09	1.52
6	1.58	1.60	2.15	......	2.6	2.35	1.40	1.40	1.05	1.32
7	1.52	1.58	1.99	......	2.4	2.3	1.20	1.32	1.02	1.42
8	1.40	1.50	2.0	......	2.7	2.2	1.25	1.48	1.02	1.65
9	1.35	1.70	2.0	......	3.6	2.1	1.31	1.38	.92	1.60
10	1.25	2.4	2.0	......	3.2	2.5	1.31	1.31	.95	1.55
11	1.25	2.2	1.95	......	3.2	1.88	1.24	1.21	.95	1.48
12	1.25	2.0	2.1	......	3.2	1.82	1.31	1.15	1.10	1.45
13	1.34	1.91	1.95	......	2.6	1.78	1.30	1.14	1.12	1.45
14	1.41	1.85	2.25	......	2.55	1.80	1.20	1.02	1.10	1.28
15	1.30	1.79	2.6	......	2.2	1.78	1.09	1.09	1.14	1.28
16	1.30	1.70	2.4	......	3.3	1.65	.98	1.10	1.16	1.32
17	1.35	1.60	1.98	......	3.7	1.65	1.19	1.10	1.25	1.28
18	1.29	1.59	2.1	......	3.4	1.52	1.28	1.05	1.25	1.15
19	1.30	1.58	2.05	......	3.7	1.55	1.25	1.02	1.20	1.10
20	1.48	2.6	2.1	......	4.5	1.46	1.20	1.05	1.15	1.12
21	2.65	2.5	1.80	......	4.6	1.44	1.18	.92	1.35	1.05
22	2.4	2.3	1.78	2.35	3.9	1.41	1.11	.90	1.25	.98
23	2.1	2.65	1.90	2.3	3.4	1.42	1.22	1.08	1.20	1.20
24	1.92	2.35	2.1	2.1	3.0	1.40	1.26	1.22	1.12	1.30
25	2.15	2.2	1.95	2.05	2.85	1.38	1.32	1.16	1.00	1.15
26	2.05	2.0	1.75	5.8	3.2	1.46	1.25	1.10	1.10	1.22
27	2.3	1.90	1.95	7.8	3.9	1.32	1.12	1.08	1.08	1.28
28	2.1	1.85	2.0	4.6	3.4	1.40	1.00	1.08	1.05	1.20
29	2.0	1.72	2.2	4.2	3.5	1.38	1.15	1.10	1.16	1.25
30	1.92	1.79	2.3	3.7	4.0	1.25	1.46	1.09	1.40	1.20
31	1.90	......	2.05	3.4	......	1.24	......	1.08	1.52	......

NOTE.— Discharge relation affected by ice December 29 to March 21, inclusive.

Daily discharge, in second-feet, of Deer River at Brasher Iron Works, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Mar.	April	May	June	July	Aug.	Sept.
1	30	143	171	......	864	656	61	96	44	124
2	51	124	180	......	1,190	524	74	92	40	157
3	166	122	199	......	656	375	78	85	44	149
4	199	117	279	......	446	309	82	85	30	124
5	143	122	279	......	428	325	85	78	45	102
6	112	115	238	......	375	294	85	85	40	74
7	102	112	197	......	309	279	58	74	37	88
8	85	99	199	......	410	251	64	96	37	124
9	78	133	199	......	808	225	72	82	27	115
10	64	309	199	......	610	341	72	72	30	107
11	64	251	187	......	610	171	63	59	30	96
12	64	199	225	......	610	157	72	52	46	92
13	77	177	187	......	375	149	71	51	48	92
14	86	164	265	......	358	153	58	37	46	68
15	71	151	375	......	251	149	45	45	51	68
16	71	133	309	......	656	124	33	46	53	74
17	78	115	194	......	864	124	57	46	64	68
18	70	113	225	......	704	102	68	40	64	52
19	71	112	212	......	864	107	64	37	58	46
20	96	375	225	......	1,420	93	58	40	52	48
21	392	341	153	......	1,500	91	56	27	78	41
22	309	279	149	294	980	86	47	25	64	33
23	225	392	175	279	704	88	61	44	58	58
24	180	294	225	225	524	85	66	61	48	71
25	239	251	187	212	465	82	74	53	35	52
26	212	199	143	2,810	610	93	64	46	46	61
27	279	175	187	......	980	74	48	44	44	68
28	225	164	199	1,500	704	85	35	44	40	58
29	199	137	......	1,190	754	82	52	46	53	64
30	180	151	......	864	1,050	64	93	45	85	58
31	175	......	......	704	......	63	......	44	102	......

NOTE.— Daily discharge determined from a rating curve that is well defined below 3,500 second feet.

Monthly discharge of Deer River at Brasher Iron Works, N. Y., for the year ending September 30, 1914

[Drainage area, 206 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October	392	30	142	0.689	0.79	A
November	392	99	186	.903	1.01	A
December	375	143	210	1.02	1.18	A
April	1,500	251	703	3.41	3.80	A
May	656	63	187	.908	1.05	A
June	93	33	63.9	.310	.34	B
July	96	25	57.3	.278	.32	B
August	102	27	49.6	.241	.28	B
September	157	33	81.1	.394	.44	B

NOTE.— Mean discharge, December 29 to 31, estimated, 187 second-feet.

SARANAC RIVER NEAR PLATTSBURG, N. Y.

Location.— At the Indian Rapids power plant (formerly known as Lozier dam) of the Plattsburg Gas & Electric Co., about 6 miles above the mouth of the river at Plattsburg, N. Y.

Records available.— March 27, 1903, to September 30, 1914.

Drainage area.— 607 square miles. (From U. S. Geological Survey, topographic sheets.)

Gages.— The crest gage is a vertical staff in the angle of the wing wall at the end of the intake racks. Datum changed 0.76 foot (higher) August 20, 1906. The tail race gage is a vertical staff spiked to timber crib dike between tail race and river about 50 feet below power house. Datum has changed slightly by settling of crib work. An inclined staff gage at the cable station has been used to determine a discharge rating at that point Records of kilowatt output are obtained from readings of watt meter on switch board at half-hour intervals.

Discharge measurements.—Made from cable at head of Indian rapids one-fourth mile below the dam; low water measurements made by wading under cable or in tail race.

Discharge ratings.— The records include the flow over a concrete spillway 171.25 feet in crest length, a rating for which has been prepared by the use of coefficients derived from experiments made in the hydraulic laboratory of Cornell University on a model section of the dam;[1] the discharge through two power units equipped with 300 kilowatt generators, the ratings for which have been determined by current meter measurements; and the discharge through two 5-foot waste gates when open.

Regulation.— The lakes and ponds on the main stream and tributaries above the station comprise a water surface area of about 25.5 square miles. The natural storage afforded by these reservoirs has been largely increased by the State dam at Lower Saranac lake, the operation of which affects the distribution of flow throughout the year.

Accuracy.— At low stages there is considerable fluctuation in discharge from the operation of automatic governors on the wheel gates. Errors due to this cause are largely compensated by the use of 48 observations a day. A comparison made in July, 1914, of the discharge at the cable station, as determined by a portable recording gage, and the discharge as computed by the power plant ratings showed a very close agreement for the daily means.

Co-operation.— Records of gage heights and watt meter readings are furnished by the Plattsburg Gas & Electric Co., Herbert A. Stutchbury, superintendent.

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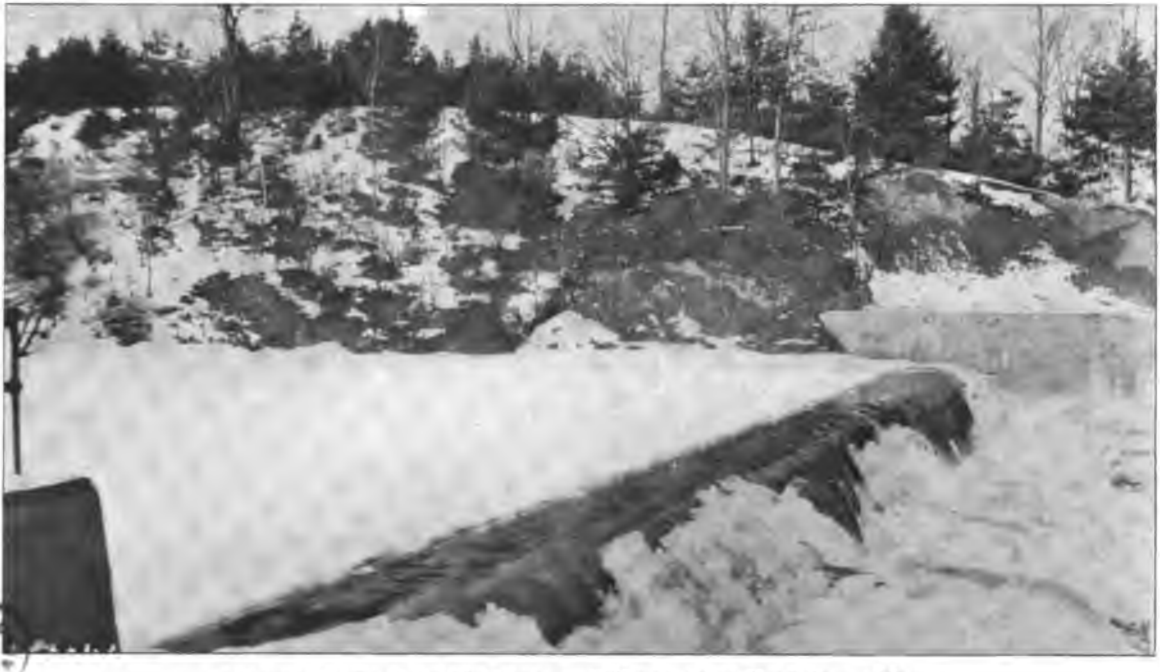
[1] See Water Supply Paper 200, pages 98–100.



Saranac River Near Plattsburg — Spillway Crest Kept Free of Ice

OF MICH.

Discharge measurements of Saranac River at Plattsburg, N. Y., during the year ending September 30, 1914

DATE	Made by	[a] Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
May 13	C. S. De Golyer	2.88	1,300
13	do	2.85	1,220
26[b]	do	2.26	584
July 8[b]	C. H. Pierce	2.22	620
8[b]	do	2.19	584

[a] Slope gage below dam.
[b] Measurement made by wading at regular section.

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1909

[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	420	230	294	0.484	0.56
November	500	165	330	.543	.61
December	410	140	309	.509	.59
January	1,000	230	406	.668	.77
February	1,270	355	785	1.29	1.34
March	1,060	440	756	1.24	1.43
April	5,150	840	2,520	4.15	4.63
May	3,840	1,290	2,040	3.36	3.87
June	1,630	270	903	1.49	1.66
July	600	275	412	.678	.78
August	465	245	346	.570	.66
September	570	135	341	.561	.63
The year	5,150	135	785	1.29	17.53

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1910

[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	540	210	353	0.581	0.67
November	610	225	437	.719	.80
December	520	260	375	.617	.71
January	630	310	402	.662	.76
February	570	305	394	.649	.68
March	2,770	720	1,510	2.49	2.87
April	2,030	750	1,240	2.04	2.28
May	2,200	700	982	1.62	1.87
June	1,330	320	724	1.19	1.33
July	470	255	319	.526	.61
August	410	250	333	.549	.63
September	690	300	365	.601	.67
The year	2,770	210	618	1.02	13.88

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1911
[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	660	295	436	0.718	0.83
November	770	295	455	.750	.84
December	475	220	385	.634	.73
January	540	265	412	.679	.78
February	490	350	397	.654	.68
March	1,690	330	613	1.01	1.16
April	3,260	850	1,960	3.23	3.60
May	2,210	830	1,320	2.17	2.50
June	1,160	630	788	1.30	1.45
July	610	170	394	.649	.75
August	370	140	266	.438	.50
September	530	190	346	.570	.64
The year	3,260	140	647	1.06	14.46

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1912
[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	585	275	378	0.623	0.72
November	770	325	463	.763	.85
December	1,300	360	757	1.25	1.44
January	670	300	463	.763	.88
February	550	340	419	.690	.74
March	930	255	491	.809	.93
April	5,580	570	2,300	3.79	4.23
May	2,120	750	1,180	1.94	2.24
June	2,170	265	869	1.43	1.60
July	485	255	371	.611	.70
August	520	225	361	.595	.69
September	1,670	430	855	1.41	1.57
The year	5,580	225	742	1.22	16.56

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1913
[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	1,130	320	670	1.10	1.27
November	1,500	560	850	1.40	1.56
December	1,180	500	789	1.30	1.50
January	2,960	660	1,350	2.22	2.56
February	1,080	465	625	1.03	1.07
March	6,090	400	2,190	3.61	4.16
April	4,960	1,240	2,090	3.44	3.84
May	2,170	450	840	1.38	1.59
June	1,360	370	719	1.18	1.32
July	490	260	364	.599	.69
August	535	160	326	.537	.62
September	500	155	280	.461	.51
The year	6,090	155	923	1.52	20.69

Monthly discharge of Saranac River near Plattsburg, N. Y., for the year ending September 30, 1914

[Drainage area, 607 square miles]

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area
October	680	250	468	0.771	0.89
November	1,050	325	672	1.11	1.24
December	970	440	656	1.08	1.24
January	710	320	516	.850	.98
February	640	430	521	.858	.89
March	1,760	420	677	1.11	1.28
April	6,410	950	2,310	3.80	4.24
May	2,870	430	1,210	1.99	2.29
June	670	305	482	.793	.88
July	560	260	384	.632	.73
August	625	250	368	.606	.70
September	580	90	369	.607	.68
The year	6,410	90	719	1.18	16.04

NOTE.— Discharge as previously published for 1908–09 and preceding years, included discharge through turbines, as computed on the basis of manufacturers gate ratings. Comparisons with current meter measurements showed those estimates to be too small, the percentage difference being greatest at the lower stages. The data for the period October 1, 1908, to December 31, 1909, has been recomputed on the basis of a current meter rating of the discharge through the turbines and corresponding values of the kilowatt output.

AUSABLE RIVER AT AUSABLE FORKS, N. Y.

Location.— In the village of Ausable Forks, immediately below the junction of the east and west branches and about 15 miles above the mouth of the river.

Records available.— August 17, 1910, to September 30, 1914.

Drainage area.— 444 square miles. (Measured on U. S. Geological Survey topographic sheets.)

Gage.— Chain, on the left bank, about 1,000 feet below the junction of east and west branches of Ausable river; read twice daily; datum unchanged.

Control.— Sand and gravel; likely to shift. Channel divided by an island.

Discharge measurements.— Made from a cable about 1½ miles below the gage. At this place the river flows in one channel.

Winter flow.— Discharge relation slightly affected by ice. Flow determined from frequent discharge measurements and climatologic records.

Accuracy.— Conditions at the measuring section favorable. Discharge rating curve is well defined and estimates are good.

Special study.— A portable automatic gage was installed at this station and a continuous record of gage height obtained from July 11 to September 30, inclusive. This record showed a continual fluctuation in stage having a small range. It was found that monthly mean discharge values based on semi-daily gage heights were in error as follows: July 11–31, 3.5 per cent; August, 4.1 per cent; September, 0.5 per cent. Some of the daily discharges showed larger errors, but these errors were compensating.

Discharge measurements of Ausable River at Ausable Forks, N. Y., during the year ending September 30, 1914

DATE	Made by	Gage height	Discharge
1914		*Feet*	*Sec.-ft.*
Jan. 1*a*	W. S. Easterly	3.72	250
24*b*	do	3.65	190
Feb. 25*c*	C. S. De Golyer	3.60	129
Mar. 23	W. S. Easterly	3.66	235
31	do	4.42	1,040
April 1	do	4.38	1,000
1	do	4.46	1,070
21	C. S. De Golyer	6.25	5,170
22	do	5.52	3,220
22	do	5.41	2,950
22	do	5.39	2,950
July 7	do	3.76	274
7*d*	do	3.74	269
10*e*	C. H. Pierce	3.68	217
24*f*	C. S. De Golyer	3.71	237
Aug. 19*g*	C. C. Covert	3.58	177

a Backwater from ice. Measurement made through ice 800 feet above gage.
b Backwater from ice. Measurement made by wading ¼ mile below gage.
c Backwater from ice. Measurement made through ice 2,000 feet below gage.
d Measurement made by wading 500 feet above cable.
e Measurement made by wading 500 feet above gage.
f Measurement made by wading 400 feet above gage.
g Measurement made by wading 1 mile below gage.

Daily gage height, in feet, of Ausable River, at Ausable Forks, N. Y., for the year ending September 30, 1914
[A. S. Baker, observer]

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	3.55	3.88	3.76	3.73	3.94	3.57	4.04	5.35	3.78	3.66	3.59	3.79
2	3.89	3.78	3.82	3.71	3.86	3.62	4.55	5.45	3.78	3.68	3.51	3.70
3	4.25	3.78	3.86	3.74	3.84	3.65	4.36	4.90	3.75	3.75	3.54	3.67
4	4.08	3.76	3.94	3.66	3.84	3.63	4.22	5.20	3.80	3.68	3.51	3.70
5	3.86	3.74	4.15	3.62	3.84	3.65	4.18	5.30	4.16	3.64	3.53	3.63
6	3.80	3.71	4.24	3.66	3.98	3.65	4.10	4.95	3.98	3.84	3.56	3.55
7	3.80	3.68	4.27	3.65	3.69	3.65	4.15	5.20	3.84	3.72	3.51	3.72
8	3.72	3.63	4.35	3.71	3.79	3.65	4.05	4.95	3.80	3.81	3.49	3.88
9	3.64	3.82	4.15	3.66	4.05	3.66	5.50	4.90	3.74	3.78	3.43	3.82
10	3.62	5.45	4.10	3.69	3.85	3.74	4.50	4.80	3.74	3.66	3.45	3.78
11	3.56	4.55	4.25	4.35	3.85	3.65	4.60	4.80	3.62	3.71	3.47	3.69
12	3.58	4.34	4.08	3.82	4.11	3.67	4.60	4.65	3.60	3.81	3.46	3.64
13	3.72	4.33	3.93	3.68	4.20	3.64	4.32	4.49	3.59	3.76	3.43	3.57
14	3.67	4.45	3.86	3.58	3.92	3.60	4.26	4.50	3.59	3.67	3.45	3.56
15	3.72	4.20	3.82	3.78	3.75	3.56	4.42	4.40	3.58	3.62	3.42	3.55
16	3.71	3.94	3.77	3.90	4.12	3.70	4.55	4.26	3.58	3.59	3.46	3.55
17	3.64	3.88	3.75	3.74	3.98	4.23	4.45	4.23	3.57	3.56	3.48	3.52
18	3.64	3.86	3.72	3.70	3.84	4.22	4.85	4.37	3.60	3.50	3.51	3.50
19	3.62	3.82	3.66	3.91	3.76	3.85	7.3	4.39	3.51	3.51	3.55	3.45
20	3.92	4.35	3.66	3.72	3.60	3.90	8.3	4.37	3.52	3.54	3.60	3.42
21	4.7	4.62	3.68	3.72	3.62	3.75	6.7	4.90	3.66	3.51	3.61	3.45
22	4.5	4.45	3.68	3.84	3.58	3.64	5.5	4.12	3.62	3.52	3.58	3.47
23	4.45	4.18	3.75	3.82	3.48	3.68	5.35	4.38	3.58	3.54	3.61	3.46
24	4.00	4.10	3.68	3.66	3.52	3.68	5.15	4.10	3.57	3.65	3.56	3.49
25	4.25	4.65	3.74	3.62	3.64	3.75	5.05	3.98	3.62	3.62	3.52	3.54
26	4.35	4.50	3.68	4.25	3.62	4.55	5.30	4.01	3.56	3.59	3.48	3.55
27	4.28	4.30	3.72	3.78	3.61	5.05	5.45	4.00	3.48	3.59	3.48	3.54
28	4.15	3.88	3.82	3.68	3.62	5.00	6.0	4.20	3.44	3.55	3.49	3.73
29	4.50	3.81	3.72	3.75	......	3.70	6.5	3.90	3.74	3.56	3.56	3.66
30	4.05	3.74	3.88	4.15	......	3.55	6.1	3.84	3.65	3.60	3.90	3.67
31	4.50	......	3.82	3.98	......	4.24	......	3.75	......	3.61	3.89	......

NOTE — Discharge relation affected by ice December 27 to January 27, and from February 11 to 28, inclusive. Gage heights from July 11 to September 30, inclusive, are means of 24 hourly gage heights each day from the portable automatic gage.

Daily discharge, in second-feet, of Ausable River at Ausable Forks, N. Y., for the year ending September 30, 1914

DAY	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1.....	160	452	329	250	520	151	550	2,840	294	204	161	302
2.....	462	348	388	241	431	179	1,240	3,070	294	217	120	230
3.....	932	348	431	265	409	198	954	1,860	270	270	135	211
4.....	694	331	520	202	409	185	766	2,490	310	217	120	230
5.....	431	311	790	174	409	198	716	2,720	692	192	130	185
6.....	367	282	918	202	567	198	620	1,960	484	347	146	140
7.....	367	257	962	194	265	198	680	2,490	347	246	120	246
8.....	292	218	1,080	282	358	198	562	1,960	310	319	111	384
9.....	226	388	790	241	642	204	3,190	1,860	262	294	87	328
10.....	210	3,500	720	265	420	262	1,160	1,670	262	204	95	294
11.....	167	1,420	932	1,080	......	198	1,320	1,670	179	238	103	224
12.....	181	1,070	694	388	......	211	1,320	1,400	166	319	99	194
13.....	292	1,050	508	218	......	192	898	1,140	161	278	87	151
14.....	249	1,250	431	147	......	166	818	1,160	161	211	95	146
15.....	292	860	388	301	......	146	1,040	1,010	156	179	83	140
16.....	282	520	339	420	......	230	1,240	818	156	161	99	140
17.....	226	452	320	265	......	779	1,080	779	151	146	107	125
18.....	226	431	292	234	......	766	1,760	968	166	115	120	115
19.....	210	388	241	431	......	356	8,400	996	120	120	140	95
20.....	496	1,080	241	249	......	402	12,100	968	125	135	166	83
21.....	1,700	1,550	257	249	140	270	6,490	1,860	204	120	172	95
22.....	1,330	1,250	257	358	117	192	3,190	644	179	125	156	103
23.....	1,250	832	320	339	70	217	2,840	982	156	135	172	99
24.....	590	720	257	194	87	217	2,380	620	151	198	146	111
25.....	932	1,600	311	174	127	270	2,160	484	179	179	125	135
26.....	1,080	1,330	257	846	140	1,240	2,720	516	146	161	107	140
27.....	976	1,000	249	301	131	2,160	3,070	504	107	161	107	135
28.....	790	452	339	257	140	2,060	4,480	740	91	140	111	254
29.....	1,330	378	249	320	......	230	5,890	402	262	146	146	204
30.....	655	311	299	804	......	140	4,750	347	198	166	402	211
31.....	1,330	......	339	567	......	792	......	270	......	172	393	......

Note.— Daily discharge given within the frosen periods December 27 to January 27, and February 21 to 28, are only approximate. Daily discharge for open water periods based upon wel defined rating curves. New rating curve used beginning March 1, 1914.

Monthly discharge of Ausable River at Ausable Forks, N. Y., for the year emding September 30, 1914

[Drainage area, 444 square miles]

MONTH	Discharge in Second-feet				Run-off	Accuracy
	Maximum	Minimum	Mean	Per square mile	Depth in inches on drainage area	
October....................	1,700	160	604	1.36	1.57	A
November..................	3,500	218	813	1.83	2.04	A
December..................	1,080	241	469	1.06	1.22	B
January.....................	1,080	147	337	.759	.88	B
February...................	720	70	332	.748	.78	C
March.......................	2,160	140	426	.959	1.11	B
April.........................	12,100	550	2,610	5.88	6.56	B
May..........................	3,070	270	1,330	3.00	3.46	A
June.........................	692	91	225	.507	.57	A
July..........................	347	115	197	.444	.51	A
August......................	402	83	141	.317	.36	A
September..................	384	83	182	.410	.46	A
The year...............	12,100	83	638	1.44	19.52	.....

Note.— Main discharge, February 11 to 20, estimated, 391 second-feet.

LAKE GEORGE

For the purpose of determining the rate of change and the range in elevation of the water surface of the lake, gages were established on Lake George in July, 1913, at three points — Lake George, Sagamore (Bolton Landing), and Rogers Rock.

The gage at Lake George was fastened to the concrete wall underneath the east side of the pagoda at Fort William Henry Hotel, near the landing used for motor boats. The observer is G. L. Martin.

At Sagamore the gage was fastened to the south side of the coal dock for Sagamore Hotel, on the west side of Green Island, about 200 feet north of the eastern end of the highway bridge that joins the island and the mainland. The observer is S. G. Finkle.

At Rogers Rock the gage is fastened to a pile in the back end of a covered boat house. The boat house is in a bay on the north side of the steamboat landing. The observer is George O. Cook.

All gages are of the vertical staff type, made up of standard bronze section graduated to feet, tenths, and half-tenths. The sections are securely fastened to bed planks which in turn are fastened to the piles or concrete support. They were not set to any particular datum, but each gage was referred to a substantial bench mark by the use of an engineer's level. The gages are read once each day to the nearest half-tenths, and the force and direction of the wind are recorded.

A comparative study of these gage heights and those obtained at the mill of the International Paper Company indicates that the zeros of all three gages are below the crest of the dam as follows:

Lake George	4.75 feet below crest
Sagamore	4.9 feet below crest
Rogers Rock	3.4 feet below crest

All three gages were read until June 30, 1914. Comparison of the records up to this date showed that one gage would indicate the mean elevation of the lake and the observations at Lake George and Sagamore were discontinued July 1, 1914. The results of the observations are presented in the following tables:

Daily gage height, in feet, of stations on Lake George, N. Y., for the year ending September 30, 1914

DAY	LAKE GEORGE, OCTOBER			SAGAMORE OCTOBER			ROGERS ROCK, OCTOBER		
		WIND			WIND			WIND	
	Gage height	Direction	Force	Gage height	Direction	Force	Gage height	Direction	Force
1	3.35	N.	....	3.45	Calm.		1.9	S.	M.
2	3.35	N.	....	3.5	Calm.		1.9	N.	H.
3	3.35	N.	....	3.5	N.E.	L.	2.0	N.	M.
4	3.35	N.	....	3.5	N.E.	H.	1.9	N.	H.
5	3.3	S.	....	3.5	N.E.	L.	1.95	Calm.	
6	3.3	S.	....	3.45	Calm.		1.98	S.W.	H.
7	3.25	S.	....	3.45	S.	L.	1.95	S.	L.
8	3.25	N.	....	3.4	Calm.		1.92	S.W.	L.
9	3.25	N.	....	3.4	Calm.		1.92	Calm.	
10	3.25	N.	....	3.4	Calm.		1.92	S.	M.
11	3.25	N.	....	3.4	S.	H.	1.9	S.W.	M.
12	3.25	S.	....	3.35	N.	L.	1.9	S.W.	L.
13	3.25	S.	....	3.35	N.E.	H.	1.9	N.	L.
14	3.25	N.E.	....	3.35	N.E.	H.	1.85	N.	H.
15	3.25	N.E.	....	3.3	N.E.	H.	1.9	N.	M.
16	3.25	N.E.	....	3.3	N.E.	H.	1.8	N.	H.
17	3.25	N.E.	....	3.3	N.E.	H.	1.8	N.	M.
18	3.25	N.E.	....	3.3	N.E.	H.	1.8	S.	M.
19	3.2	S.	....	3.3	N.E.	H.	1.7	N.	H.
20	3.15	S.	....	3.35	S.	H.	1.9	S.	L.
21	3.15	S.	....	3.4	S.	H.	2.1	S.	H.
22	3.15	N.	....	3.4	S.	H.	1.88	S.E.	.....
23	3.15	S.E.	....	3.4	S.	H.	1.98	S.	H.
24	3.15	S.	....	3.45	S.	H.	1.88	S.	L.
25	3.15	S.	....	3.5	S.	H.	1.9	Calm.	
26	3.2	N.	....	3.55	N.E.	H.	1.95	N.	L.
27	3.2	N.	....	3.6	S.	L.	2.05	Calm.	
28	3.2	N.	....	3.6	S.	L.	2.1	S.	M.
29	3.2	N.	....	3.6	S.	L.	2.1	S.	M.
30	3.2	N.	....	3.55	Calm.		2.05	N.	M.
31	3.2	N.	....	3.55	N.	L.	2.1	S.W.	H.

L.= Light. M.= Medium. H.= Heavy.

Daily gage height in feet, of stations on Lake George, N. Y., for the year ending September 30, 1914

DAY	LAKE GEORGE, NOVEMBER			SAGAMORE, NOVEMBER			ROGERS ROCK, NOVEMBER			LAKE GEORGE, DECEMBER			SAGAMORE, DECEMBER			ROGERS ROCK, DECEMBER		
	Gage height in feet	WIND		Gage height in feet	WIND		Gage height in feet	WIND		Gage height in feet	WIND		Gage height in feet	WIND		Gage height in feet	WIND	
		Direction	Force		Direction	Force		Direction	Force		Direction	Force		Direction	Force		Direction	Force
1	3.2	S. W.	....	3.5	N. W.	M.	2.08	S.W.	H.	3.15	S.	....	3.3	S.	L.	1.82	S.	M.
2	3.2	S.	....	3.5	S.	L.	2.0	N.	M.	3.15	S.	....	3.25	Calm.		1.8	Calm.	
3	3.2	N.	....	3.5	N.	L.	2.0	S.	M.	3.15	N.	....	3.25	W.	L.	1.8	N.	M.
4	3.2	S.	....	3.45	N.	L.	2.05	S.W.	H.	3.15	N.	....	3.25	N.	L.	1.78	Calm.	
5	3.2	N.W.	....	3.45	Calm.		2.0	S.E.	L.	3.1	N.E.	....	3.2	Calm.		1.7	N.	M.
6	3.2	N.	....	3.45	S.	L.	1.98	S.	H.	3.1	W.	....	3.2	N.E.	L.	1.75	S.	M.
7	3.2	S.E.	....	3.4	S.	L.	1.95	S.	L.	3.1	S.	....	3.2	S.	M.	1.78	S.	L.
8	3.2	S.	....	3.4	S.	L.	1.92	S.	L.	3.1	S.	....	3.2	Calm.		1.9	S.	H.
9	3.2	S.	....	3.4	S.	H.	1.9	N.E.	L.	3.1	S.E.	....	3.25	S.	M.	1.95	S.	M.
10	3.2	S.	....	3.4	S.	H.	2.1	S.	H.	3.1	S.	....	3.25	S.	M.	1.95	S.	H.
11	3.25	N.E.	....	3.4	S.	H.	2.02	S.	H.	3.1	N.	....	3.3	Calm.		1.85	N.	H.
12	3.25	N.	....	3.4	S.	H.	2.0	S.	L.	3.1	N.	....	3.3	Calm.		1.95	S.	M.
13	3.25	W.	....	3.4	S.	M.	2.0	S.	M.	3.1	W.	....	3.3	Calm.		1.85	Calm.	
14	3.25	N.	....	3.4	W.	L.	1.98	Calm.		3.1	S.	....	3.3	N.W.	M.	1.9	S.	M.
15	3.25	N.	....	3.4	S.	L.	1.9	N.W.	L.	3.1	S.	....	3.3	Calm.		1.85	S.	H.
16	3.25	N.	....	3.4	N.	L.	1.9	N.	M.	3.1	N.	....	3.3	S.	H.	1.8	N.	L.
17	3.25	S.	....	3.35	S.	H.	1.9	Calm.		3.1	N.	....	3.25	S.	H.	1.85	S.	H.
18	3.2	S.	....	3.35	S.	L.	1.9	S.	H.	3.1	S.W.	....	3.25	S.	L.	1.8	Calm.	
19	3.2	S.	....	3.35	S.	H.	1.88	S.	L.	3.1	S.	....	3.25	S.	L.	1.8	S.	M.
20	3.2	S.	....	3.35	Calm.		1.9	S.	M.	3.1	S.	....	3.25	S.	L.	1.78	S.	M.
21	3.2	W.	....	3.35	Calm.		1.85	Calm.		3.1	S.W.	....	3.25	Calm.		1.75	Calm.	
22	3.2	S.	....	3.35	S.	H.	1.8	S.	M.	3.1	N.E.	....	3.25	N.	L.	1.7	N.	H.
23	3.2	S W.	....	3.35	S.W.	H.	1.85	S.W.	H.	3.1	N.	....	3.25	Calm.		1.75	Calm.	
24	3.2	W.	....	3.35	N.	L.	1.85	S.	H.	3.1	N.	....	3.3	Calm.		1.75	N.	L.
25	3.2	N.	....	3.3	S.	L.	1.85	S.W.	M.	3.1	N.	....	3.3	N.E.	L.	1.78	N.	L.
26	3.2	N.	....	3.3	N.E.	H.	1.8	N.	H.	3.1	N.	....	3.3	N.E.	H.	1.9	N.	H.
27	3.2	N.	....	3.3	N.	L.	1.8	N.	M.	3.1	N.	....	3.3	Calm.		1.9	N.	M.
28	3.15	N.	....	3.3	Calm.		1.8	S.W.	L.	3.1	S.	....	3.3	S.	L.	1.9	N.	L.
29	3.15	S.	....	3.3	N.	L.	1.78	N.	M.	3.1	S.	....	3.3	S.	L.	1.85	N.E.	M.
30	3.15	S.	....	3.3	Calm.		1.8	S.	M.	3.1	N.	....	3.3	W.	M.	1.8	S.	M.
31	......	....	....	......	....	....	......	....	....	3.1	N.	....	3.3	N.E.	M.	1.8	S.	M.

L.=Light. M.=Medium. H.=Heavy.

Daily gage height, in feet, of stations on Lake George, N. Y., for the year ending Sept. 30, 1914

DAY	LAKE GEORGE, JANUARY			SAGAMORE, JANUARY			ROGERS ROCK, JANUARY			LAKE GEORGE, FEBRUARY			SAGAMORE, FEBRUARY			ROGERS ROCK, FEBRUARY		
		WIND			WIND			WIND			WIND			WIND			WIND	
	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force
1	3.1	N.	....	3.3	S.W.	....	1.75	N.E.	L.	3.0	W.	....	3.2	S.	L.	1.75	S.	L.
2	3.1	N.	....	3.3	S.	L.	1.8	S.	M.	3.05	S.	....	3.2	S.	L.	1.72	S.W.	M.
3	3.1	S.	....	3.3	N.E.	L.	1.7	N.	L.	3.05	S.	....	3.2	S.	L.	1.72	W.	M.
4	3.1	N.E.	....	3.3	N.E.	L.	1.7	N.	H.	3.05	W.	....	3.2	S.W.	....	1.78	W.	H.
5	3.1	N.E.	....	3.3	N.E.	H.	1.7	N.	H.	3.05	S.	....	3.2	S.W.	....	1.7	Calm.	
6	3.1	S.	....	3.3	S.	L.	1.78	S.	L.	3.05	S.	....	3.2	N.E.	....	1.7	S.E.	L.
7	3.1	N.	....	3.3	S.	L.	1.75	S.	H.	3.05	S.	....	3.2	S.	....	1.72	W.	H.
8	3.1	N.	....	3.25	S.	L.	1.7	Calm.		3.05	N.W.	....	3.2	N.E.	....	1.72	S.W.	H.
9	3.1	S.	....	3.25	Calm.		1.7	Calm.		3.05	S.	....	3.25	N.E.	....	1.75	S.	M.
10	3.1	S.	....	3.25	N.W.	....	1.75	S.	M.	3.05	N.	....	3.25	N.E.	....	1.72	N.	H.
11	3.1	N.	....	3.2	S.	L.	1.68	N.	L.	3.05	N.E.	....	3.25	N.W.	....	1.7	N.	L.
12	3.1	N.	....	3.2	W.	H.	1.7	S.W.	H.	3.05	N.E.	....	3.25	N.W.	....	1.68	N.	M.
13	3.1	N.	....	3.2	W.	H.	1.7	N.	M.	3.05	N.E.	....	3.25	N.E.	....	1.68	N.E.	H.
14	3.1	W.	....	3.2	W.	H.	1.65	N.	L.	......	N.E.	....	3.25	N.E.	....	1.7	N.E.	H.
15	3.0	S.	....	3.25	N.E.	H.	1.65	S.	L.	3.3	W.	....	3.25	N.E.	....	1.72	N.	L.
16	3.0	N.	....	3.25	Calm.		1.95	S.	L.	3.3	S.	....	3.25	N.E.	....	1.8	S.	L.
17	3.0	S.	....	3.25	N.E.	L.	1.6	N.	H.	3.25	N.	....	3.25	N.E.	....	1.85	Calm.	
18	2.95	S.	....	3.25	N.E.	L.	1.62	N.	L.	3.25	N.	....	3.25	N.E.	....	1.85	S.W.	L
19	2.95	S.	....	3.25	Calm.		1.65	S.W.	M.	3.25	N.E.	....	3.25	N.E.	....	1.8	N.E.	M.
20	2.95	S.	....	3.25	S.	L.	1.6	N.	M.	3.25	N.E.	....	3.25	N.E.	....	1.75	N.E.	H.
21	2.95	S.	....	3.25	S.	L.	1.62	S.	L.	3.25	N.E.	....	3.25	N.E.	....	1.78	Calm.	
22	2.95	W.	....	3.25	S.	H.	1.6	S.	L.	3.25	S.	....	3.25	S.E.	....	1.8	S.W.	M.
23	2.95	N.	....	3.25	Calm.		1.6	S.	M.	3.25	E.	....	3.25	N.E.	....	1.75	N.	H.
24	2.95	S.	....	3.25	W.	L.	1.65	S.W.	L.	3.2	N.E.	....	3.3	N.E.	....	1.75	N.	H.
25	2.95	S.	....	3.2	W.	L.	1.65	N.	H.	3.2	S.	....	3.3	S.E.	....	1.78	S.W.	M.
26	2.95	S.	....	3.2	S.	L.	1.65	N.W.	L.	3.15	N.	....	3.3	S.E.	....	1.7	S.	M.
27	2.95	E.	....	3.2	S.	L.	1.68	S.	H.	3.15	S.	....	3.3	S.E.	....	1.7	S.W.	L.
28	2.95	S.	....	3.15	N.	L.	1.62	N.W.	M.	3.15	S.	....	3.3	S.E.	....	1.72	Calm.	
29	2.95	W.	....	3.15	S.	H.	1.65	S.	H.	......	....	....	......	....	....	......	....	.....
30	2.95	S	....	3.15	W.	L.	1.75	N.W.	L.	......	....	....	......	....	....	......	....	.....
31	2.95	S.	....	3.2	N.E.	L.	1.78	S.	M.	......	....	....	......	....	....	......	....	.....

L.=Light. H.=Heavy. M.=Moderate.

Daily gage height, in feet, of stations on Lake George, N. Y., for the year ending Sept. 30, 1914

DAY	LAKE GEORGE, MARCH			SAGAMORE, MARCH			ROGERS ROCK, MARCH			LAKE GEORGE, APRIL			SAGAMORE, APRIL			ROGERS ROCK, APRIL		
		WIND			WIND			WIND			WIND			WIND			WIND	
	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force	Gage height in feet	Direction	Force
1	3.15	N.E.	....	3.3	N.E.	....	1.78	N.	H.	3.8	S.	....	3.55	S.W.	....	2.35	S.	L.
2	3.3	W.	....	3.3	N.E.	....	1.9	N.	L.	4.0	S.	....	3.65	N.E.	....	2.6	N.	H.
3	3.3	S.	....	3.3	S.	....	1.85	N.	M.	4.1	W.	....	3.8	N.E.	....	2.8	N.	M.
4	3.3	W.	....	3.3	S.	....	1.9	S.W.	M.	4.15	S.W.	....	3.9	S.	....	2.85	S.	M.
5	3.3	W.	....	3.3	S.	....	1.85	N.	M.	4.2	S.W.	....	4.0	N.E.	....	2.9	N.	M.
6	3.3	N.	....	3.3	Calm.		1.8	N.	M.	4.25	S.W.	....	4.1	N.E.	....	2.95	S.W.	H.
7	3.3	W.	....	3.3	W.	....	1.9	S.	M.	4.3	S.W.	....	4.2	N.E.	....	2.9	N.E.	L.
8	3.3	S.W.	....	3.3	S.W.	....	1.9	S.W.	H.	4.4	N.	....	4.4	N.W.	....	3.0	N.	L.
9	3.3	S.	....	3.3	W.	....	1.9	S.	M.	4.7	W.	....	4.8	S.W.	....	3.35	S.W.	M.
10	3.3	S.	....	3.35	S.	....	1.85	N.	M.	4.8	N.	....	5.0	S.W.	....	3.45	S.W.	H.
11	3.3	W.	....	3.35	S.	....	1.85	N.	M.	4.85	S.	....	5.15	S.W.	....	3.55	S.	H.
12	3.3	S.	....	3.35	S.	....	1.88	N.	L.	5.0	W.	....	5.2	W.	....	3.6	S.W.	H.
13	3.3	S.	....	3.35	S.	....	1.8	N.W.	L.	5.1	N.E.	....	5.25	N.W.	....	3.7	N.	M.
14	3.3	N	....	3.4	S.	....	1.8	N.	L.	5.15	N.	....	5.3	N.E.	....	3.75	S.	M.
15	3,25	N.E.	....	3.4	S.	....	1.8	N.W.	L.	5.15	S.E.	....	5.35	N.E.	....	3.8	S.	M.
16	3.25	N.	....	3.4	S.	....	1.82	S.W.	H.	5.25	S.	....	5.4	N.E.	....	3.9	N.	H.
17	3.25	N	....	3.4	S W	....	1.9	S	L.	5.3	W.	....	5.45	N.E.	....	3.95	Calm.	
18	3.25	N.E.	....	3.4	S.W.	....	1.85	N.	H.	5.35	N.E.	....	5.5	S.W.	....	4.05	S.	M.
19	3.25	S.	....	3.4	Calm.		1.88	S.W.	H.	5.55	S.W.	....	5.55	S.W.	....	4.2	S.	M.
20	3.25	N.E.	....	3.45	S.	....	1.85	Calm.		5.8	S.W.	....	5.9	Calm.		4.5	N.	H.
21	3.25	S.	....	3.45	S.	....	1.85	S.	L.	6.0	N.	....	6.1	Calm.		4.72	N.W.	M.
22	3.2	S.	....	3.45	S.	....	1.85	S.	M.	6.1	S.W.	....	6.2	W.	....	4.8	S.W.	H.
23	3.2	S.	....	3.45	S.	....	1.82	S.	M.	6.15	N.	....	6.3	W.	....	4.75	N.E.	H.
24	3.2	S.	....	3.5	S.	....	1.8	Calm.		6.15	S.E.	....	6.35	Calm.		4.75	N.W.	M.
25	3.2	S.	....	3.5	S.	....	1.82	S.	L.	6.15	S.	....	6.35	S.E.	....	4.8	S.	H.
26	3.25	S.	....	3.55	N.E.	....	1.85	S.	M.	6.15	S.E.	....	6.35	N.E.	....	4.8	Calm.	
27	3.3	S.	....	3.55	N.E.	....	2.0	S.W.	....	6.2	N.	....	6.35	N.E.	....	4.85	N.	L.
28	3.35	N.E.	....	3.55	N.E.	....	2.05	N.	L.	6.2	S.	....	6.4	S.W.	....	4.88	S.	L.
29	3.45	S.	....	3.55	Calm.		2.1	N.	L.	6.2	N.E.	....	6.45	N.E.	....	4.85	N.	H.
30	3.6	S.	....	3.55	S.	....	2.25	N.	M.	6.3	N.E.	....	6.5	N.E.	....	4.92	N.	H.
31	3.65	N.	....	3.55	N.E.	....	2.3	N.	L.	......	....	....	......	....	....	......	....	....

L.=Light. H.=Heavy. M.=Moderate

Daily gage height, in feet, of stations on Lake George, N. Y., for the year ending Sept. 30, 1914

DAY	LAKE GEORGE, MAY			SAGAMORE, MAY			ROGERS ROCK, MAY			LAKE GEORGE, JUNE			SAGAMORE, JUNE			ROGERS ROCK, JUNE		
	Gage height in feet	WIND Direction	WIND Force	Gage height in feet	WIND Direction	WIND Force	Gage height in feet	WIND Direction	WIND Force	Gage height in feet	WIND Direction	WIND Force	Gage height in feet	WIND Direction	WIND Force	Gage height in feet	WIND Direction	WIND Force
1	6.3	N.W.	....	6.5	N.E.	....	4.95	N.	H.	5.45	N.	....	5.65	Calm.		4.15	N.	M.
2	6.3	W.	....	6.45	N.E.	....	4.98	N.	H.	5.45	W.	....	5.6	Calm.		4.1	N.	M.
3	6.3	S.E.	....	6.45	Calm.		4.95	Calm.		5.45	S.E.	....	5.6	N.E.	....	4.1	Calm.	
4	6.25	S.E.	....	6.4	N.	L.	4.92	N.	M.	5.45	S.E.	....	5.6	Calm.		4.15	Calm.	
5	6.25	S.	....	6.4	Calm.		4.88	Calm.		5.45	N.W.	....	5.6	Calm.		4.12	N.	M.
6	6.25	N.	....	6.35	Calm.		4.8	N.	H.	5.45	N.	....	5.55	Calm.		4.1	Calm.	
7	6.25	N.	....	6.35	Calm.		4.8	Calm.		5.4	W.	....	5.55	S.	L.	4.1	S.	M.
8	6.2	N.E.	....	6.3	N.E.	....	4.78	S.	L.	5.4	N.E.	....	5.55	Calm.		4.1	Calm.	
9	6.2	S.	....	6.3	N.E.	....	4.75	N.	L.	5.4	S.	....	5.5	N.	L.	4.1	S.	M.
10	6.1	W.	....	6.25	S.W.	....	4.7	S.W.	M.	5.4	N.W.	....	5.5	N.	L.	4.1	S.W.	M.
11	6.05	N.	....	6.25	S.W.	....	4.65	N.	M.	5.4	W.	....	5.5	W.	L.	4.05	Calm.	
12	6.0	N.W.	....	6.2	Calm.		4.6	N.	L.	5.4	N.	....	5.45	Calm.		4.05	S.W.	M.
13	5.95	N W.	....	6.15	Calm.		4.65	S.W.	L	5.35	N.E.	....	5.45	Calm.		4.0	S.W.	L.
14	5.9	N.E.	....	6.1	W.	L.	4.62	S.	L.	5.35	N.E.	....	......	....	....	3.98	S.	L.
15	5.9	W.	....	6.5	Calm.		4.55	N.	M.	5.3	S.	....	......	....	....	4.0	S.W.	M.
16	5.85	S.	....	6.0	N.E.	....	4.5	N.	M.	5.25	S.	....	......	....	....	3.9	N.W.	M.
17	5.8	W.	....	6.0	Calm.		4.5	Calm.		5.2	N.	....	......	....	....	3.9	S.W.	L.
18	5.8	W.	....	6.0	Calm.		4.48	S.	M.	5.15	S.	....	......	....	....	3.88	S.	M.
19	5.8	S.W.	....	6.0	Calm.		4.45	S.	L.	5.15	S.	....	......	....	....	3.9	S.	H.
20	5.8	S.W.	....	5.95	Calm.		4.4	Calm.		5.15	N.	....	......	....	....	3.8	S.W.	H.
21	5.75	S.	....	5.95	W.	L.	4.38	Calm.		5.1	N.	....	......	....	....	3.8	Calm.	
22	5.75	S.	....	5.9	W.	L.	4.35	S.	M.	5.1	N.	....	......	....	....	3.8	Calm.	
23	5.7	N.W.	....	5.9	Calm.		4.32	S.W.	H.	5.1	W.	....	......	....	....	3.78	S.W.	L.
24	5.65	N.W.	....	5.85	S.	L.	4.32	S.	L.	5.1	N.	....	......	....	....	3.8	S.	M.
25	5.6	S.E.	....	5.85	S.	L.	4.35	S.	M.	5.1	N.	....	......	....	....	3.78	S.	L.
26	5.6	S.	....	5.8	S.	L.	4.3	S.	H.	5.05	S.	....	......	....	....	3.7	N.	L.
27	5.55	N.E.	....	5.75	Calm.		4.3	S.W.	H.	5.05	N.E.	....	......	....	....	3.68	N.	M.
28	5.55	W.	....	5.75	Calm.		4.2	N.E.	H.	5.0	N.E.	....	......	....	....	3.65	S.	M.
29	5.55	S.W.	....	5.7	N.W.	L.	4.2	S.	L.	5.0	S.	....	......	....	....	3.7	S.	M.
30	5.5	S.	....	5.7	Calm.		4.18	S.	M.	5.0	N.E.	....	......	....	....	3.6	N.	M.
31	5.45	W.	....	5.65	S.W.	L.	4.15	S.	M.	......	....	....	......	....	....	......	....	.....

L.= Light. H.= Heavy. M.= Moderate.

Daily gage height, in feet, of stations on Lake George, N. Y., for the year ending September 30, 1914

DAY	ROGERS ROCK, JULY			ROGERS ROCK, AUGUST			ROGERS ROCK, SEPTEMBER		
	Gage height in feet	WIND		Gage height in feet	WIND		Gage height in feet	WIND	
		Direction	Force		Direction	Force		Direction	Force
1	3.62	N.	L.	3.28	S.	L.	3.12	S.	M.
2	3.65	Calm.		3.3	S.	M.	3.12	S.	M.
3	3.68	S.	L.	3.28	N.	H.	3.15	S.	M.
4	3.65	S.	L.	3.25	N.	L.	3.12	S.W.	H.
5	3.65	S.	L.	3.2	S.	M.	3.1	S.	M.
6	3.65	N.	L.	3.25	S.	M.	3.05	S.	M.
7	3.65	N.	M.	3.22	S.	L.	3.1	S.	M.
8	3.7	S.	M.	3.2	Calm.		3.0	N.	M.
9	3.65	Calm.		3.15	Calm.		2.98	N.	M.
10	3.6	S.	M.	3.18	S.	M.	2.92	N.	L.
11	3.65	S.	M.	3.2	S.	M.	2.9	N.	M.
12	3.6	Calm.		3.05	N.	H.	2.88	N.	M.
13	3.62	S.	L.	3.1	Calm.		2.85	N.	M.
14	3.6	S.	M.	3.12	S.	H.	2.85	Calm.	
15	3.6	S.	L.	3.08	Calm.		2.8	S.	L.
16	3.6	S.	M.	3.08	Calm.		2.8	N.	L.
17	3.65	S.	H.	3.1	Calm.		2.78	Calm.	
18	3.62	S.	M.	3.1	S.	M.	2.75	N.	L.
19	3.55	N.W.	M.	3.05	S.	L.	2.7	N.	L.
20	3.6	S.	L.	3.05	S.	M.	2.7	N.	L.
21	3.55	S.	M.	3.2	S.	M.	2.7	Calm.	
22	3.5	Calm.		3.1	N.	M.	2.68	S.	L.
23	3.5	S.	M.	3.05	S.	H.	2.68	S.	M.
24	3.45	N.	M.	3.05	N.	M.	2.62	N.	M.
25	3.45	S.	L.	3.1	Calm.		2.6	N.	M.
26	3.4	N.W.	M.	3.0	N.	M.	2.6	N.	M.
27	3.38	N.	M.	3.0	Calm.		2.55	N.	H.
28	3.35	N.	M.	3.02	S.	L.	2.55	N.	M.
29	3.25	N.	H.	3.05	N.	M.	2.55	Calm.	
30	3.28	N.	L.	3.15	S.W.	L.	2.5	E.	M.
31	3.3	S.	L.	3.05	N.	L.	......	....	.....

L.= Light. H.= Heavy. M.= Moderate.

Miscellaneous measurements during the year ending September 30, 1914

DATE	Stream	Tributary to —	Locality	Gage height	Discharge
1914.				*Feet*	*Sec.-ft.*
Sept. 1	West Canada Creek	Mohawk River	Kast Bridge, N. Y.	29.44	1,300
20[a]	Mongrup River	Delaware River	Rio, N. Y	.69	34.6
Aug. 24	South Branch, Oswegatchie River	Oswegatchie River	Talcville, N. Y	[b]4.0	77.0

[a] Measurement made by wading 600 feet above gage.
[b] Tailrace gage height, pond gage height was 4.2 feet.

Discharge measurements of Beaver River at State Dam, N. Y.

Number	Date	Made by	Gate		Lake gage	Discharge
			Number	Opening		
	1912			*Inches*	*Feet*	*Sec.-ft.*
6	Oct. 22*c*.	G. H. Canfield	4	12	9.42	65
7	22*c*.	do	4	24	9.45	128
8	23*c*.	do	1	12	9.92	71
9	23*c*.	do	1	24	9.96	136
10	23*c*.	do	3	24	10.04	128
11	24*c*.	do	3	36	10.28	178
12	24*c*.	do	4	36	10.30	178
13	24*c*.	do	4	48	10.30	204
14	24*c*.	do	1	36	10.30	183
15	25*c*.	do	1	44½	10.51	212

c Measurement made from bridge at mouth of tunnel.

Summary of Discharge Per Square Mile

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the State of New York. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage. But the most important fact worth noting is the almost entire lack of uniformity of agreement between any two stations. It indicates that the discharge of each stream is a law unto itself, and that all projects dependent on stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

Summary of discharge, in second-feet per square mile, for all river stations for which such data are available in this report

STATION	Drainage area	1913			1914								
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
	Sq. mi.												
Hudson River at North Creek, N. Y	804	0.896	2.04	0.799	0.709	0.922	1.06	6.98	3.12	0.512	1.49	1.02	0.925
Hudson River at Thurman, N. Y	1,550	.794	1.57	.929	.641	.729	.871	7.61	3.36	.748	.794	.781	.703
Hudson River at Spier Falls, N. Y	2,800	.743	1.84	1.07	.568	.611	.982	8.71	3.45	.589	.643	.561	.632
Hudson River at Mechanicville, N. Y	4,500	.604	1.40	1.08	.513	.682	1.67	7.49	2.87	.518	.476	.322	.429
Cedar River near Indian Lake, N. Y	85	1.68	5.48	1.45	......	......	......	14.0	7.29	.520	2.07	1.79	.804
Indian River near Indian Lake, N. Y	132	1.47	.009	.340	2.85	3.10	1.97	.042	.739	.677	......	......	......
Schroon River at Riverbank, N. Y	534	.322	.674	.809	.626	.528	.699	7.45	3.51	.895	.343	.261	.399
Sacandaga River near Hope, N. Y	494	1.18	3.00	1.49	......	......	......	10.9	4.03	.540	.478	.411	.540
Sacandaga River at Hadley, N. Y	1,060	.905	2.42	1.28	.628	.792	1.05	8.94	3.34	.481	.374	.298	.455
West Branch of Sacandaga River at Blockbridge, N. Y	211	1.56	3.59	1.36	......	......	......	......	......	......	......	......	......
Alplous Kill near Charlton, N. Y	24.9	.103	.613	.582	.259	.663	3.66	6.71	1.25	.092	.129	.005	.013
Hoosic River near Eagle Bridge, N. Y	512	.785	1.46	1.49	.902	......	3.40	6.78	2.21	.592	.510	......	......
Kinderhook Creek at Rossman, N. Y	331	......	.858	.985	1.19	1.22	5.05	6.74	......	......	......	......	......
Delaware River at Port Jervis, N. Y	3,250	.606	1.77	1.14	.868	1.80	4.03	6.43	2.53	.536	.597	.471	.254
East Branch of Delaware River at Fish Eddy, N. Y	790	1.00	3.65	2.19	.738	1.19	4.06	13.3	2.32	.492	.446	.619	.303
West Branch of Delaware River at Hale Eddy, N. Y	611	.408	1.87	1.22	.692	1.39	4.34	6.48	2.49	.462	.728	.723	.357
Susquehanna River at Conklin, N. Y	2,350	.272	1.28	.910	.617	1.01	3.33	6.68	2.36	.519	.843	.745	.485
Chenango River near Chenango Forks, N. Y	1,420	.339	1.16	.866	.761	1.35	3.78	7.13	2.06	.608	.417	.775	.680
Chemung River at Chemung, N. Y	2,440	.459	1.10	.356	......	......	......	......	......	......	......	......	......
Allegheny River at Red House, N. Y	1,640	.308	1.82	.799	1.41	1.52	3.62	5.18	3.43	.416	.211	.226	.237
Cattaraugus Creek at Versailles, N. Y	467	.530	1.19	.660	1.93	.944	4.00	3.23	3.53	.501	.251	.600	.570
Little Tonawanda Creek at Linden, N. Y	22	.031	.197	.214	1.34	.764	4.39	3.34	2.17	.190	.077	.209	.238
Genesee River at St. Helena, N. Y	1,030	.202	.808	.362	1.15	1.16	3.35	3.33	2.93	.278	.107	.301	.417
Genesee River at Jones' Bridge, N. Y	1,410	.216	.752	.375	......	......	.304	3.41	......	......	......	......	......
Genesee River at Rochester, N. Y	2,360	.143	.470	.242	.585	1.26	2.82	3.68	2.78	.416	.171	.276	.324
Owasco Outlet near Auburn, N. Y	206	.360	.380	.510	1.05	1.41	2.11	7.04	2.00	.767	.908	.748	1.38
Salmon River at Stillwater Bridge near Redfield, N. Y	191	2.46	3.59	2.69	......	......	......	......	......	......	......	......	......
Salmon River near Pulaski, N. Y	260	2.20	3.10	2.32	......	......	......	9.00	......	......	......	......	......
Orwell Brook near Altmar, N. Y	22.1	1.75	1.99	2.24	1.94	......	3.87	4.48	1.71	1.57	.556	.547	.588
Moose River at Moose River, N. Y	370	1.61	3.16	1.21	.856	......	2.06	7.84	3.34	.961	.957	.938	1.00
Middle Branch, Moose River at Old Forge, N. Y	51.5	2.29	3.77	.348	.200	.278	3.98	4.29	1.83	1.18	.577	1.35	1.87
Oswegatchie River near Ogdensburg, N. Y	1,580	.911	1.99	1.46	.665	1.72	1.65	5.01	1.94	.578	.575	.294	.480
East Branch, Oswegatchie River at Newton Falls, N. Y	166	1.89	1.95	1.67	1.49	......	1.83	3.55	2.77	1.21	1.52	1.38	1.67
Raquette River at Piercefield, N. Y	723	.569	1.74	1.69	.828	.656	.720	4.61	5.37	.974	.617	.596	.620
Raquette River at Massena Springs, N. Y	1,170	.569	1.74	1.73	......	......	......	5.50	4.73	1.20	4.74	.445	.653
St. Regis River at Brasher Center, N. Y	621	1.44	1.74	1.48	......	......	......	5.75	1.98	.625	.469	.298	.686
Deer River at Brasher Iron Works, N. Y	206	.689	.903	1.02	......	......	......	3.41	.908	.310	.278	.241	.394
Saranac River near Plattsburg, N. Y	607	.771	1.11	1.08	.850	.858	1.11	3.80	1.99	.793	.632	.606	.607
Ausable River at Ausable Forks, N. Y	444	1.36	1.83	1.06	.759	.748	.959	5.88	3.00	.507	.444	.317	.410

RAIN FALL STUDIES

The following tables give the results of observations taken at the various meterologic stations maintained during 1913–1914. These records show, in a general way, the amount of precipitation that fell during each month in New York State, together with the minimum, maximum, and mean temperatures at certain stations.

The records during the winter months are very difficult to obtain and for most stations can be considered only approximate. An effort is being made to improve this part of the work by the use of snow tubes and density buckets, with scales for translating the depth of snow in inches into water equivalent. Five stations have been equipped with special apparatus, as follows: Faust, Forked Lake, Linden, Stillwater, and Wanakena. The total snow fall in inches at each point is also published for each month. The water equivalent of this snow fall has been included in the precipitation records, under the head of "Rain or Melted Snow" and it must not be considered as extra precipitation to be added.

The precipitation records at Northville were discontinued in May, 1913. The United States Weather Bureau publishes records from another gage at this point. Precipitation and temperature records are published herewith under the name "Ranger School." This station is located in a forest at Wanakena, N. Y. The precipitation and temperature records published under the name of Wanakena are obtained at a point which is in open country. A comparison of these two records indicates the effect which forestation has upon precipitation and temperature.

During the latter part of 1913, rain gages were installed at six of the fire outlook stations which are maintained by the division of lands and forests. Observations were kept up at these points only during the summer months while the watchmen were at the stations. The stations are as follows: Ampersand Mountain, Fort Noble Mountain, Gore Mountain, Hamilton Mountain, Snowy Mountain, Whiteface Mountain.

Recorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	ALTMAR, OSWEGO COUNTY		AMPERSAND MT., FRANKLIN COUNTY		BOONVILLE, ONEIDA COUNTY		FAUST, FRANKLIN COUNTY	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	6.48	......	6.59	......	5.52	......	7.94	......
November	2.83	1.0	......	......	3.68	......	3.69	......
December	2.60	2.0	......	......	2.62	9.0	[b]2.15	9.8
1914								
January	2.44	......	......	......	1.49	5.2	2.31	17.8
February	1.91	......	......	......	2.13	11.8	[a].30	......
March	3.29	......	......	......	1.55	3.8	[b]4.51	30.0
April	4.17	......	......	......	1.14	......	......	......
May	2.92	......	......	......	2.25	......	1.23	......
June	5.47	......	3.51	......	4.04	......	.95	......
July	2.25	......	4.05	......	2.23	......	......	......
August	6.15	......	5.98	......	4.95	......	......	......
September	2.40	......	4.80	......	1.69	......	......	......
The year	42.91	......	......	......	33.29	29.8	......	......

[a] Observer absent 2–22 inclusive.
[b] Partially estimated from records of snowfall.

Recorded precipitation at the State of New York Conservation Commission rainfall observation station for the year ending September 30, 1914

MONTH	FORKED LAKE, *a* HAMILTON COUNTY		FORT NOBLE MT., HERKIMER COUNTY		GORE MT., WARREN COUNTY		HAMILTON MT., LEWIS COUNTY	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	6.12	1.2	6.87	......	5.24	......	6.10	....
November	5.45	6.0	*b*.60	......	......	......	......	....
December	3.62	30.6	......	......	......	......	......	....
1914								
January	3.48	21.6	......	......	......	......	......	....
February	2.99	31.5	......	......	......	......	......	....
March	4.58	30.0	......	......	......	......	......	....
April	6.54	14.9	......	......	......	......	......	....
May	1.72	......	2.76	......	*c*.06	......	......	....
June	3.99	......	4.05	......	2.46	......	3.12	....
July	3.45	......	4.09	......	4.00	......	3.99	....
August	6.39	......	5.28	......	5.88	......	6.05	....
September	2.81	......	3.09	......	2.34	......	1.65	....
The year	51.14	135.7	......	......	......	......	......	....

a Published by the U. S. Weather Bureau under the name of Raquette Lake.
b 1-5 inclusive.
c 22-31 inclusive.

Recorded precipitation at the State of New York Conservation Commission rainfall observation station[a] for the year ending September 30, 1914

MONTH	HOOKER, LEWIS COUNTY		HORSESHOE, ST. LAWRENCE COUNTY		KEEPAWA, *a* HAMILTON COUNTY		KNOWELHURST, WARREN COUNTY	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	*b*8.51	3.0	7.33	......	6.92	6.1	4.03	....
November	5.73	......	4.63	......	4.84	10.3	*b*4.39	3.5
December	*b*4.10	30.0	*c*3.50	......	3.07	33.9	*b*3.62	26.0
1914								
January	*b*1.40	13.0	1.56	10.0	2.62	24.2	*d*	....
February	4.80	48.0	1.17	19.2	2.47	33.6	*d*	....
March	*b*3.60	16.0	1.45	15.5	3.57	24.1	*d*	....
April	*b*5.30	10.0	2.39	......	4.51	2.8	6.11	....
May	2.52	......	1.23	......	1.35	......	1.47	....
June	5.84	......	2.45	......	3.90	......	1.81	....
July	2.60	......	2.32	......	2.59	......	3.93	....
August	4.89	......	4.84	......	5.44	......	5.14	....
September	3.25	......	2.33	......	2.96	......	2.19	....
The year	52.54	120.0	35.20	44.7	44.24	135.0	......	....

a Records from this station published by the U. S. Weather Bureau under the name of Nehasne.
b Partially estimated from records of snowfall.
c Estimated.
d Observations suspended.

Rain Gage at Orangeville — In Drainage Area of Little Tonawanda Creek

UNIV OF MICH.

Recorded precipitation at the State of New York Conservation Commission rainfall observation station for the year ending September 30, 1914

MONTH	Linden, Genesee County		Littlejohn Settlement, Oswego County		Morehouseville, Hamilton County		North Creek, Warren County	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	2.72	......	8.32	......	6.85	0.5	3.20	....
November	2.95	1.3	5.18	......	5.19	12.5	2.92	2.0
December	1.78	2.2	2.41	*a*8.7	2.87	25.0	1.99	18.0
1914								
January	2.72	19.7	2.24	......	2.84	27.5	2.11	12.0
February	1.76	18.1	1.24	......	2.61	38.5	1.73	18.0
March	3.34	24.1	2.10	......	5.43	47.2	3.27	15.0
April	3.83	6.7	3.01	......	4.56	......	*a*6.30	....
May	3.90	......	2.13	......	2.99	......	1.16	....
June	2.84	......	6.28	......	3.73	......	1.92	....
July	2.20	......	1.52	......	4.38	......	3.32	....
August	6.84	......	5.74	......	5.80	......	4.75	....
September	1.88	......	3.22	......	2.34	......	1.83	....
The year	36.76	72.1	43.39	......	49.59	151.2	34.50	65.0

a Partially estimated from records of melted snow.

Recorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	North Osceola, Lewis County		Old Forge, Herkimer County		Orangeville, Wyoming County		Otto Mills, Oswego County	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	7.63	3.0	6.67	......	3.75	......	7.29	....
November	3.64	9.0	5.17	5.2	2.61	1.5	3.68	1.5
December	3.50	49.0	3.83	28.5	.68	2.0	2.78	10.5
1914								
January	2.97	33.0	2.39	21.3	1.99	......	2.43	5.5
February	1.99	49.0	3.86	37.2	.73	......	1.87	18.5
March	3.48	48.5	4.49	28.2	3.64	......	3.30	15.5
April	5.89	4.0	5.81	4.5	3.18	......	4.54	2.5
May	3.35	......	1.85	......	5.38	......	2.80	....
June	6.89	......	5.22	......	2.85	......	7.52	....
July	3.20	......	2.76	......	1.99	......	2.43	....
August	5.80	......	6.24	......	6.23	......	5.74	....
September	4.35	......	2.82	......	2.44	......	3.14	....
The year	52.69	195.5	51.11	124.9	35.47	......	47.52	54.0

Recorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	POTSDAM, ST. LAWRENCE COUNTY		PULASKI, a OSWEGO COUNTY		RANGER SCHOOL, ST. LAWRENCE COUNTY		REDFIELD, OSWEGO COUNTY	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	5.62	......	6.01	1.0	6.78	1.4	6.43	....
November	2.77	2.0	2.52	1.0	3.76	.5	4.36	2.5
December	1.87	14.5	1.88	6.0	2.91	29.5	3.74	16.0
1914								
January	*b*	......	*b*	......	2.19	24.7	2.95	14.0
February	*b*	......	*b*	......	2.03	27.9	3.16	29.5
March	*b*	......	*b*	......	2.66	27.7	3.95	25.5
April	3.50	2.5	4.01	4.0	3.18	6.6	4.84	....
May	.99	......	3.02	......	2.01	......	3.31	....
June	3.11	......	3.40	......	3.16	......	6.15	....
July	3.06	......	2.01	......	2.12	......	2.08	....
August	3.70	......	4.90	......	5.74	......	5.02	....
September	1.61	......	2.13	......	1.90	......	3.08	....
The year	......	......	......	......	38.44	118.3	49.07	87.5

a Gage at Fox Bridge on Salmon River, about two miles upstream from Pulaski post office.
b Observations suspended.

Recorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	ROME, a ONEIDA COUNTY		SMARTVILLE, OSWEGO COUNTY		SNOWY MT. HAMILTON COUNTY		STILLWATER, OSWEGO COUNTY	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	4.37	......	8.47	......	5.79	0.3	6.89	....
November	4.35	2.0	4.38	3.0	......	......	4.23	....
December	3.39	12.0	4.03	27.5	......	......	2.52	20.0
1914								
January	4.78	28.2	3.56	17.0	......	......	2.15	9.0
February	4.28	26.8	2.96	36.2	......	......	1.55	24.0
March	6.08	32.2	3.69	39.5	......	......	3.91	44.5
April	5.21	......	3.38	4.2	......	......	4.57	....
May	4.29	......	2.48	......	1.23	......	3.09	....
June	5.35	......	7.58	......	3.51	......	5.59	....
July	6.35	......	1.76	......	6.85	......	2.27	....
August	6.06	......	6.01	......	5.61	......	5.82	....
September	3.18	......	3.35	......	2.26	......	2.53	....
The year	57.69	101.2	51.65	127.4	......	......	45.12	97.5

a At Rome City reservoir, about seven miles north of Rome.

Recorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	Varysburg, Wyoming County		Wakeley Dam, Hamilton County		Wanakena, St. Lawrence County		Wards Creek, Franklin County	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	5.03	......	4.08	......	7.46	1.4	6.13	....
November	2.77	......	1.89	4.7	4.35	0.5	[b]5.22	5.2
December	1.28	......	2.10	24.5	3.35	29.5	[b]1.49	14.0
1914								
January	[a]	......	[a]	......	2.47	24.7	[b]2.57	27.5
February	[a]	......	[a]	......	1.84	27.9	[c]1.50	15.0
March	[a]	......	[a]	......	3.86	28.0	[d]5.95	39.5
April	4.51	......	5.26	0.7	3.26	5.8	[e]6.00	....
May	5.57	......	1.40	......	2.18	......	.98	....
June	3.56	......	3.31	......	3.30	......	3.46	....
July	1.82	......	4.85	......	2.35	......	3.43	....
August	5.38	......	7.15	......	5.91	......	5.28	....
September	2.54	......	3.00	......	1.04	......	3.75	....
The year	......	......	......	......	41.87	117.8	45.76	101.2

[a] Observation suspended.
[b] Partially estimated from records of snowfall.
[c] Estimated from records of snowfall.
[d] Precipitation from March 17–31 estimated.
[e] Estimated.

Reorded precipitation at the State of New York Conservation Commission rainfall observation stations for the year ending September 30, 1914

MONTH	Wells, Hamilton County		Whiteface Mt. Essex County		Dansville, Livingston County	
	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall	Rain or melted snow	Snowfall
1913	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
October	5.82	......	5.14	8.0	......	....
November	5.04	4.2	......	......	......	....
December	2.99	18.0	......	......	......	....
1914						
January	[b]2.22	8.0	......	......	......	....
February	2.98	21.2	......	......	......	....
March	2.95	12.0	......	......	......	....
April	6.87	......	......	......	[a].46	....
May	1.73	......	......	......	5.10	....
June	1.96	......	3.84	......	1.76	....
July	4.28	......	4.08	......	.96	....
August	5.92	......	4.76	......	......	....
September	2.09	......	4.00	......	......	....
The year	44.85	63.4	......	......	......	....

[a] 19–31 inclusive.
[b] Partially estimated from records of snowfall.

Recorded temperatures at the State of New York Conservation Commission rainfall observation stations in the Adirondack Region for the year ending September 30, 1914

Degrees — Fahrenheit

MONTH	Faust, Franklin County			Forked Lake, b Hamilton County			Keepawa, Hamilton County		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
1913									
October	58.3	39.8	49.0	58.4	39.8	49.1	58.2	38.4	48.3
November	45.7	30.4	38.0	44.8	27.4	36.1	44.0	26.0	35.0
December	33.0	15.3	24.2	33.9	16.8	25.4	32.5	16.3	24.4
1914									
January	25.2	2.0	13.6	28.1	3.1	15.6	27.2	2.3	14.7
February	19.7	—8.3	5.7	21.4	—7.7	6.8	20.1	—9.4	5.4
March	36.4	13.6	25.0	35.1	12.5	23.8	34.5	12.6	23.6
April	......	......	......	45.5	24.0	34.8	45.8	24.0	34.9
May	66.5	39.9	53.2	68.4	40.1	54.2	67.8	36.9	52.4
June	a68.8	a46.5	a57.6	72.1	47.6	59.8	71.5	44.8	58.2
July	......	......	......	75.2	50.7	63.0	75.5	49.1	62.3
August	......	......	......	74.0	51.2	62.6	74.5	49.7	62.1
September	......	......	......	65.6	43.3	54.4	66.4	39.7	53.0

a 1-16 inclusive.

b Published by the U. S. Weather Bureau under the name of Raquette Lake.

Recorded temperatures at the State of New York Conservation Commission rainfall observation station in the Adirondack Region for the year ending September 30, 1914

Degrees — Fahrenheit

MONTH	Morehouseville, Hamilton County			North Creek, Warren County			Old Forge, Herkimer County		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
1913									
October	58.8	39.6	49.2	61.8	42.4	52.1	59.7	39.5	49.6
November	45.5	27.1	36.3	48.4	29.8	39.1	45.6	27.6	36.6
December	34.1	17.0	25.6	41.1	19.1	30.1	34.4	16.3	25.4
1914									
January	27.8	5.8	16.8	30.2	6.6	18.4	29.1	3.4	16.2
February	21.5	5.6	8.0	25.7	—2.7	11.5	22.5	—7.7	7.4
March	33.4	13.6	23.5	37.1	17.0	27.0	36.1	12.7	24.4
April	45.5	24.5	35.0	48.6	28.4	38.5	47.0	25.2	36.1
May	67.8	38.5	58.2	69.7	43.9	56.8	68.9	37.5	53.2
June	70.4	45.7	58.0	73.6	50.2	61.9	71.1	44.5	57.8
July	76.6	50.0	63.3	75.9	55.1	65.5	77.0	50.3	63.6
August	73.9	50.6	62.2	76.0	54.3	65.2	74.6	50.2	62.4
September	66.9	40.4	54.6	68.9	45.3	57.1	67.4	40.2	53.8

Recorded temperatures at the State of New York Conservation Commission rainfall observation stations in the Adirondack Region for the year ending September 30, 1914

Degrees — Fahrenheit

MONTH	POTSDAM, ST. LAWRENCE COUNTY			RANGER SCHOOL, ST. LAWRENCE COUNTY			ROME, a ONEIDA COUNTY		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
1913									
October	59.0	44.1	51.6	....	....	....	62.4	43.9	53.2
November	45.4	33.4	39.4	45.6	27.2	36.4	48.8	32.8	40.8
December	33.8	22.4	28.1	35.7	17.8	26.8	36.6	20.9	28.8
1914									
January	24.4	6.0	15.2	28.9	4.0	16.4	29.6	11.7	20.6
February	17.3	0.6	9.0	19.6	6.0	6.8	23.1	1.5	12.3
March	37.4	19.3	28.4	37.0	14.9	26.0	37.2	20.2	28.7
April	47.2	31.5	39.4	46.6	25.8	36.2	51.6	32.3	42.0
May	70.2	46.7	58.4	67.8	42.1	55.0	70.8	44.1	57.4
June	75.4	52.1	63.8	70.8	47.8	59.3	75.1	50.6	62.8
July	79.5	56.1	67.8	74.7	51.0	62.8	80.3	56.5	68.4
August	76.0	56.0	66.0	73.9	52.2	63.0	79.3	58.1	68.7
September	68.2	47.7	58.0	67.3	41.7	54.5	70.8	46.3	58.6

a At Rome City Reservoir, about 7 miles north of Rome.

Recorded temperatures at the State of New York Conservation Commission rainfall observation station in the Adirondack Region for the year ending September 30, 1914

Degrees — Fahrenheit

MONTH	STILLWATER, OSWEGO COUNTY			WANAKENA, ST. LAWRENCE COUNTY			WELLS, HAMILTON COUNTY		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
1913									
October	60.8	42.6	51.7	....	....	....	62.2	37.2	49.7
November	41.4	32.0	36.7	47.1	26.0	36.6	50.0	28.5	39.2
December	29.6	21.8	25.7	38.1	17.3	27.7	38.6	17.5	28.0
1914									
January	21.6	10.5	16.0	30.5	3.4	17.0	29.5	5.9	17.7
February	12.9	0.5	6.7	19.8	—6.4	6.7	27.6	—5.6	11.0
March	28.6	18.6	23.6	36.5	14.6	25.6	40.0	15.5	27.8
April	41.4	30.6	36.0	47.9	26.2	37.0	48.8	28.0	38.4
May	58.4	41.8	50.1	70.0	39.8	54.9	71.8	39.8	55.8
June	64.3	48.6	56.4	72.5	46.4	59.4	76.5	47.3	61.9
July	70.9	54.7	62.8	79.4	48.5	64.0	79.5	53.6	66.6
August	71.2	55.0	63.1	80.5	49 9	65.2	79.3	52.7	66.0
September	58.9	43.7	51.3	....	33.8	....	72.9	40.8	56.8

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